JPRS-UMM-86-009

28 APRIL 1986

USSR Report

MACHINE TOOLS AND METALWORKING EQUIPMENT

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service (NTIS), Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semimonthly by the NTIS, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS-UMM-86-009

28 APRIL 1986

USSR REPORT

MACHINE TOOLS AND METALWORKING EQUIPMENT

CONTENTS

INDUSTRY PLANNING AND ECONOMICS

Kolesnikov Details Machine Building Tasks in 12th Five-Year Plan
(K. S. Kolesnikov; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENII: MASHINOSTROYENIYE, No 1, Feb 86) 1

Ukrainian Gosplan Official on Machine Building Tasks
(V. N. Khalapsin; TEKHNOLOGIYA I ORGANIZATSIYA PROIZVODSTVA, No 1, Jan 86) 4

Machine Building Improvement: Structure, Acceleration, Quality
(PLANOVOYE KHOZYAYSTVO, No 2, Feb 86) 8

Autonomous Financing Experiment at Sumy Machine Building NPO
(V. Lukyanenko, V. Moskalenko; PRAVDA, 30 Dec 85) 13

Production Improvements at Machine-Tool Association Imeni Sverdlov
(S. Pochin; LENINGRADSKAYA PRAVDA, 11 Feb 86) 17

Balmont Interview on CEMA 'Interrobot' NPO
(B. V. Balmont, B. Konovalov; IZVESTIYA, 23 Dec 85) 20

Editorial Stresses Necessity of Improving Efficiency
(MACHINOSTROITEL, No 12, Dec 85) 24

Advantages of Flexible Production Systems Discussed
(V. Vasilyev; PLANNOVOYE KHOZYAYSTVO, No 12, Dec 85) 28

Typical Problems, Frustrations With Plant Modernization Viewed
(V. Avdevich; SOVETSKAYA ROSSIYA, 3 Dec 85) 31

Improvement of Quality With Reduction of Raw Material Expenditures
(V. Burtyl; NARODNOYE KHOZYAYSTVO BELORUSSII, No 11, Nov 85) 35

METAL-CUTTING AND METAL-FORMING MACHINE TOOLS

Centralized Automation Assistance Urged by Chimkent Plant Engineer
(F. Vetrov; NARODNOYE KHOZYAYSTVO KAZAKHSTANA, No 12, Dec 85) 39

OTHER METALWORKING EQUIPMENT

Large-Scale Standardization in the Machine Industry
(A. N. Baykov, et al.; STANDARTY I KACHESTVO, No 10, Oct 85) 42

Kiev Conference on Lasers in Machine Tool, Instrument Manufacturing
(N. I. Zakharova; TEKHNOLOGIYA I ORGANIZATSIYA PROIZVODSTVA, No 1, Jan 86) 46

Laser Technology for Machining Center Holes in Metal
(V. S. Kovalenko, V. P. Dyatel; TEKHNOLOGIYA I ORGANIZATSIYA PROIZVODSTVA, No 1, Jan 86) 49

SDL-3 Electrochemical Machine Tool
(A. I. Dubovik, et al.; TEKHNOLOGIYA I ORGANIZATSIYA PROIZVODSTVA, No 1, Jan 86) 51

AUTOMATED LINES AND AGGREGATED MACHINING SYSTEMS

Problems in Developing Flexible Automation Cited
(D. Palterovich; PLANOVOYE KHOZYAYSTVO, No 12, Dec 85) 55

INDUSTRY PLANNING AND ECONOMICS

KOLESNIKOV DETAILS MACHINE BUILDING TASKS IN 12TH FIVE-YEAR PLAN

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENII: MASHINOSTROYENIYE in Russian No 1, Feb 86 pp 3-5

[Article by USSR Academy of Sciences Corresponding Member K. S. Kolesnikov: "Accelerated, Qualitative Development of Machinebuilding: One of the Main Tasks of the 12th Five-Year Plan"]

[Text] The CPSU Central Committee has published for nationwide discussion the "Basic Directions of USSR Economic and Social Development in 1986-1990 and Up To 2000."

Accelerated socioeconomic development and comprehensive intensification of and improvement in the efficiency of production based on scientific-technical progress are required for unswerving improvement in the material and cultural standards of living of the Soviet people. It is extremely necessary to develop machinebuilding, which plays a commanding role in accelerating scientific-technical progress, at accelerated rates. Its rates of growth are to be raised 1.5- to two-fold just in the 12th Five-Year Plan. Creating and setting up the production of new-generation equipment capable of ensuring many-fold increases in labor productivity and of opening up the development of automated manufacturing facilities is a matter of top-priority importance.

The machines being developed and produced by industry must possess better operating characteristics and must be more economical, less materials-intensive and more reliable in operation. This can be achieved if the following are done when designing the machines and developing their components:

1) use of new principles of physics and improved methods of calculating operating processes, working elements, and machine dynamics and durability;

2) use of progressive materials permitting operation at high temperatures, pressures and speeds, reduction in machine weight, and improved resistance to wear and corrosion;

3) orientation towards automated technological processes capable of ensuring geometric precision when producing the machines and the required surface quality in the parts being machined, in order to reduce wear and corrosion and improve operating reliability.

Automated machine design permitting selection of optimum machine arrangements and parameter relationships, maximum unit and part standardization and analysis

of the potential of the technological processes of production, and continuous economic analysis must be comprehensively developed. In order to automate design, mathemetical simulation methods and data banks on standardized units and parts must be created and developed comprehensively, and a set of design materials which include their features, specifications and the potential of the production technological processes, the best achievements of foreign companies, inventions and patents, must be included in their programs.

New materials will play a very important role in improving machinebuilding. Aluminum, titanium and heat-resistant alloys have enabled us to raise aviation technology to a qualitatively new level; semiconductor materials and films have been the basis for creating small, high-speed, economical computers for a qualitative transformation of instruments, measuring and radio equipment; structural plastics and composite materials have not only replaced metal in many instances, but, because they are corrosion-resistant, they permit the development of machines and units which could not be created without them.

In addition to steels and structural plastics, extensive use is currently being made of ceramics, called the "third machinebuilding material." The reference is to "fine" or "new" ceramics made with such high-purity inorganic substances as silicon nitride and silicon carbide, a non-oxide corrosion-resistant ceramic which does not require cooling. Making gas turbine vanes with the "new ceramics" permits a substantial increase in working-medium temperatures and improves efficiency by 15 percent.

The extensive use of low-alloy carbon steels in construction and machinebuilding provides an opportunity to reduce the amount of metal used in construction components and machinery. Metal-fluoroplastic materials and special coatings provide an opportunity to reduce bearing wear and to keep parts from corroding.

The technology of machinery production, in the broad sense, is of important significance in accelerating scientific-technical progress.

We first of all must develop the production of blanks by creating rolling equipment which is less metal- and energy-intensive, by producing sheet and section rolled metal products which are more accurate, by broadening the assortment of special-section rolled metal products, by considerably expanding helical rolling with smaller tolerances in machining machinebuilding parts, by creating flexible manufacturing systems to obtain die-rolled sections from alloy steels, by creating automated sectors and technology for mass-producing cold-rolled parts with reduced cross-section areas which will not require subsequent machining, and by creating presses and technology for die forging with minimal machining tolerances.

It is necessary to continue improving the development of highly productive molding machines and automated lines, to obtain die-rolled sections by continuous horizontal casting from a liquid bath through crystallizers, casting in metal molds, die casting to obtain good metal structures and low machining tolerances, perfecting casting production technology and liberating workers from difficult, dangerous labor.

One of the most important tasks is to create and develop automated sectors, shops and production facilities, to automate manual labor as the basis for increasing the productivity of machinebuilding enterprises. The development of progressive technological processes must occur simultaneously with the creation of technological machinery, equipment and tools, flexible manufacturing systems for single-item and small-series production, and highly productive specialized mass-production lines.

The creation of new welding units and automated welding lines, the wider use of plasma processes, powder metallurgy and physicochemical methods of working metal, the creation and development of diagnostic equipment for technological processes -- these are constant conditions for perfecting machinebuilding production.

Along with improving labor productivity, we are set the task of significantly improving the quality of the machines being produced. It is the task of technologists to implement the ideas of designers in machinery production, to create machines which will operate long and reliably. In this area, the technological methods of imparting to the surfaces of parts particular qualities which will prevent corrosion, wear and fatigue failure due to vibration are of particular importance. Carbonitration instead of carburization, gas calorizing, plasma spraying, electric-spark alloying, shotblasting and hydroshotblasting, laser heat treatment, diamond turning and other methods will be further developed and used more widely.

The country's higher educational institutions have large scientific stockpiles and a large scientific potential. The Basic Directions of USSR Economic and Social Development are therefore entirely correct in formulating the task of "taking steps to significantly improve the use of scientific potential in the higher schools, substantially expanding the amount of scientific research and development being done and achieving a sharp rise in their national economic return. Widely using progressive new forms of organizing scientific activity which permit the quick resolution of major interbranch scientific-technical problems. Creating interbranch scientific-technical complexes and centers for the development and broad-scale introduction of fundamentally new types of equipment and technology. Improving the interaction of academy, branch and VUZ sectors of science."

11052
CSO: 1823/104

INDUSTRY PLANNING AND ECONOMICS

UKRAINIAN GOSPLAN OFFICIAL ON MACHINE BUILDING TASKS

Kiev TEKHNOLOGIYA I ORGANIZATSIYA PROIZVODSTVA in Russian No 1, Jan 86 pp 1-4

[Article by UkSSR Gosplan Deputy Chairman V. N. Khalapsin: "A Shock-Work Five-Year Plan for Republic Machinebuilding"]

[Text] The primary role in resolving the tasks of accelerating scientific-technical progress and changing the economy over to an intensive path of development belongs to machinebuilding, the branch in which scientific-technical concepts are materialized in new and more effective machinery and equipment and in which the material-technical base of production is shaped. In this connection, the rates of machinebuilding development need to be increased now, in the 12th Five-Year Plan, 1.5- to two-fold.

The draft Basic Directions of USSR Economic and Social Development in 1986-1990 and Up To 2000 point out that "radical renovation and outstripping development of the machinebuilding complex are to be given top priority.... The amount of capital investment directed into developing the machinebuilding complex is to be increased substantially. The updating of the active portion of fixed production assets is to be increased to 10-12 percent annually."

Machinebuilding is being set a number of complicated new tasks. It must first of all ensure:

radical improvement in the technical level of machinebuilding output, the quality of its manufacture and its competitiveness on the world market;

progressive structural advances in the production of machinebuilding output, changing over to supplying machinery, equipment and instruments in complete sets, with the organization of an extensive network of company equipment service and repair;

retooling and renovating machinebuilding production on the basis of the extensive use of fundamentally new technological processes and systems;

deepening production specialization and broadening production cooperation, developing (mechanical) assembly types of enterprises;

accelerating the updating of fixed production assets, improving the use of existing assets and significantly reducing the time involved in mastering production at new capacities;

attaining high mobility in the overall production-technical potential of machinebuilding branches, that is, the ability of respond quickly to the dynamically changing requirements of the national economy for progressive equipment;

a significant increase in the effectiveness of and reduction in the time required for scientific research and development, accelerated development of the experimental and testing base, and extensive introduction of automation equipment at all stages of research and development, as well as of progressive methods of simulation and testing;

increasing the production of machinery, equipment, mechanisms and tools designed to significantly reduce expenditures of manual labor in the national economy, and especially of physically difficult and low-productivity labor, in the years just ahead;

top-priority delivery of systems and complete sets of machinery, equipment and instruments in the amounts needed to carry out the USSR Food Program, USSR Energy Program and Comprehensive Program for Developing Consumer Goods Production and the Services Sphere, to continue industrializing capital construction, as well as retooling metallurgy, chemical industry and transport;

systematic improvement in the planning, forms, methods and organizational structure of management and the entire economic mechanism; developing economic methods of management for purposes of accelerating qualitative growth in and intensification and increased effectiveness of machinebuilding production so as to ensure high rates of scientific-technical progress.

A 128-percent increase in the rates of production growth has been anticipated for the 12th Five-Year Plan for enterprises of the Ministry of Automotive Industry, 133 percent for the Ministry of Heavy and Transport Machinebuilding, 140 percent for the Ministry of Power Machinebuilding, Ministry of Electrical Equipment Industry, Ministry of Construction, Road and Municipal Machinebuilding and Ministry of Machinebuilding for Light and Food Industry and Household Appliances, and 145-170 percent for the Ministry of Chemical and Petroleum Machinebuilding, Ministry of Machine Tool and Tool Building Industry, Ministry of Tractor and Agricultural Machinebuilding, Ministry of Machinebuilding for Animal Husbandry and Fodder Production, and Ministry of Instrument Making, Automation Equipment and Control Systems. Approximately the same rates of growth must be achieved at enterprises of the indicated ministries located in the UkSSR.

Republic plants will significantly increase their production and improve the quality of their turbines, diesel generators, diesel locomotives, electric locomotives, refrigeration units, NC machine tools, computer equipment, automobiles, tractors, combines, excavators, loaders, elevators, coal combines and tunneling complexes, and various equipment for the agroindustrial complex.

In 1986-1990, the scientific bases of a number of large production associations and institutes in the UkSSR will be significantly strengthened, including those of the "Kharkov Turbine Plant" PO imeni Kirov, the Conveyor Manufacturing Design Institute (Lvov), the Kramatorsk NIIPTmash [scientific research and technological planning institute of machinebuilding], the "Yuzhdizelmash" association (Tokmak), the All-Union Institute of Electrical Equipment Production Technology (Cherkassy), the Welding Production Planning Institute and Scientific Research, Technological Design and Planning Institute of Robot Engineering for Automotive Industry (Kiev) and others.

Significant capacities will be created to produce NC machine tools at the Lvov Milling Machine Tools Plant, the Odessa Precision Machine Tools Plant imeni 25th

CPSU Congress, the Odessa Radial Drilling Machines Plant, and "Komsomolets" machine tool manufacturing plant in Berdichev; capacities to produce machine tools equipped with mechanization devices will be created at the Ivano-Frankovsk Mechanical Press Plant, the Khmelnitskiy Automatic Thermoplast Machine Tools Plant, the "Elektrotyazhmash" plant in Kharkov, the Lubensk Calculator Plant, the "Elektronmash" associations in Chernovitsy and Odessa, the "Tochelektropribor" plant in Kiev, the "Uzhgorodpribor" and "Lvovpribor" plants, and elsewhere.

Increasing the number of specialized general-machinebuilding production facilities, including construction of a large rolled metal parts facility in the Kharkov area, is an important link in resolving the complex of UkSSR machinebuilding development tasks in the 12th Five-Year Plan.

The Basic Directions of USSR Economic and Social Development in 1986-1990 and Up To 2000 anticipate "reducing three- to four-fold the time involved in developing and mastering the production of new equipment. Ensuring that all new types of equipment be at least 1.5- to two-fold better in terms of productivity and reliability than analogous output now in production."

It is not only the rate of outstripping development itself which will take on decisive importance in machinebuilding, but also the relationship of total production volume and production volume by type of machinebuilding equipment output to the physical volume of active production assets in operation which must be promptly updated in a planned manner.

In connection with the changeover of the economy to an intensive path of development, the times until equipment becomes obsolescent are reduced and the proportion of machinery and equipment requiring replacement are increased. This determines the shaping of a powerful new factor which determines the additional requirements of the national economy for new and more effective equipment.

One mandatory requirement of these new machines will be a relative reduction in their cost per unit of useful end result and production effectiveness growth (increased return on capital, reduced output net cost, improved labor productivity) where they are used.

Increasing the effectiveness of the tools of labor in production and now being developed will facilitate steady growth in production profitability, both at machinebuilding supplier enterprises and at consumer enterprises, which will, in turn, create prerequisites for generating ever-increasing sources of financing for new projects for expanded reproduction and production capacity growth in machinebuilding, for accelerated updating of the material-technical base in other branches of the national economy.

One of the primary directions of industry retooling will be to increase the release of NC machine tools and to use them to create flexible manufacturing systems. The following data testify to the effectiveness of these systems: the machine tool load factor increases to 0.85 - 0.9, the parts processing cycle is two- to three-fold shorter, the demand for metalworking machine tools is reduced 2.5- to three-fold, and output net cost decreases three- to five-fold.

Constant expansion of the products mix necessitates increasing the flexibility of production systems. Thus, machinebuilding currently produces more than 125,000 types of output.

Analysis shows that approximately a third of all machine tools in use in machinebuilding and metalworking (including those in single-item and small-series production, about two-thirds) can be replaced by NC machine tools. In the UkSSR the fleet of NC machine tools is to be increased to 20,000 by 1990 which, given a machine tool fleet operation shift index of 1.5, will permit a reduction in the demand for highly skilled machine tool operators of approximately 40,000 persons and which will reduce the demand for production space and save considerable capital investment.

Machinebuilding enterprises are constantly increasing their production of cultural, personal and household goods. In 1990, we intend to be producing a total of 3.8 billion rubles worth of such goods, as against 2.6 billion rubles worth in 1985. Much attention is being paid to improving their quality and to broadening and updating their assortment on the basis of introducing the latest achievements of science, engineering and leading production experience into production, of deepening specialization and broadening cooperation.

New goods which are distinguished by their reliability and economy of operation will be produced in the 12th Five-Year Plan, for example: better-designed boilers, semiautomatic washing machines, household spin dryers, 8-10 Watt luminescent lamps with 8-10 percent higher light output, economical krypton lamps in wattages up to 100W, baby carriages, bicycles, motorcycles, and so on.

Branch workers are aware of the responsibility entrusted to them for accelerating scientific-technical progress and changing the economy over to tracks of intensive development. The movement for a worthy greeting to the 27th CPSU Congress is growing. The experiment at the Dnepropetrovsk Combine Plant imeni K. Ye. Voroshilov on certifying jobs, with the resulting economic impact there of about 1.4 million rubles, has found strong support. The "Highest Yield From Each Work Hour" initiative at the Kiev Machine Tool Manufacturing PO, which enabled the association to meet the five-year assignment for labor productivity growth rates in the first half of 1985, is being disseminated.

Collectives at the Kremenchug Automotive Plant imeni 50th Anniversary of the Soviet Ukraine, the Odessa "Prodmash," the "Zaporozhtransformator" and "Kievtorgmash" production associations, theTernopol "Vatra," the "Kislorodmash" scientific-production association in Odessa, and the "Azovselmash" (Berdyansk) have also achieved good results in the competition.

Complex, important tasks face republic machinebuilders in the 12th Five-Year Plan. Judging by the results of the socialist competition and by the results achieved in carrying out the production program, we can confidently say that the tasks set them will be resolved within the time periods established by the party.

11052
CSO: 1823/121

INDUSTRY PLANNING AND ECONOMICS

MACHINE BUILDING IMPROVEMENT: STRUCTURE, ACCELERATION, QUALITY

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 2, Feb 86 pp 3-11

[Unattributed article: "Machine Building: Improving Structure, Rate of Development, Quality"]

[Excerpts] Intensification of social production under current conditions is related to changes of structural policy, which is achieved on the basis of planned distribution of priorities in development of economic sectors. National economic priorities in turn determine the changes in the structure of capital investments, their systematic substantiated concentration in decisive directions of scientific and technical progress and acceleration of means of production that support an increase of the production of consumer goods.

The relationship of social and individual needs to improvement of the structure of social production is determined in the draft of the new addition of the CPSU Program as the core of the party's economic strategy. "Transfer to the rails of intensification," it is emphasized in it, "requires serious structural changes in the economy. The national economy should be rearranged flexibly and on time according to progressive changes in science, engineering and technology and in social and individual needs. Sectors that support scientific and technical progress and successful solution of social problems must be developed at higher tempos and an optimal ratio of consumption and accumulation and improvement of the proportions between the means of production and consumer goods must be achieved..."

This in the most concentrated exposition is the essence of the most important qualitative changes in our economy.

The structure of metalworking equipment in machine tool building is being improved. Two-thirds of the plants of the sector produce machine tools with numerical program control, which support a multiple increase of labor productivity. Tens of machining centers, flexible production modules and robot engineering have been assimilated. However, a considerable part of machine tools with NC [numerical program control] and other types of new equipment remains uninstalled. It is obvious that existing deficiencies in planning the reequipping of sectors and of separate enterprises are reflected here also. The consequences of government efforts are reduced with the situation. Acceleration of technical progress means the use of new equipment rather than simply an

increase of its output. This is even more important, since new types of numerical program control units, computer hardware and units for automation of production processes at instrument-building enterprises are developed and assimilated.

It is noted in the draft of Basic directions that, along with insufficient rates of renovation of production and assimilation of new equipment and progressive technologies, the technical level and quality of many products lag behind modern requirements. The reason for these types of phenomena is that the necessary organizational and economic conditions have not been created by a number of ministries in the sectors to accelerate development, assimilation and output of essentially new and efficient equipment on a broad scale. The production and scientific and technical base is being developed and improved slowly and specialization and cooperation of production are being weakly implemented. Machine building, as the basic consumer of metal, does not yet fully utilize the capacities of progressive technologies, to increase the output of machines and metal products by conservation of metal and reduction of the metal consumption of the product. The positions of the machine-building subsectors, especially enterprises of the automotive industry, do not reflect the capabilities of scientific and technical progress.

Machine builders must impart high mobility, the capability of responding rapidly to dynamically changing needs the national economy in progressive technology, a fundamental change of the structure of manufactured machines, by reducing their weight and increasing the reliability of equipment to accelerate the rates of technical reequipping of the entire national economy on the basis of highly efficient production processes to the entire production engineering potential of the sector within the shortest possible periods.

It is envisioned in the draft of the Basic directions for the economic and social development of the USSR for 1986-1990 and for the period up to 2000 to support for this purpose during the 11th Five-Year Plan on a primary basis the fundamental renovation and advance development of the machine-building complex, primarily of machine-tool building, computer hardware, instrument building and the electrotechnical industry. The rates of growth of the product output of the sectors are planned for 1.3-1.6-fold higher compared to the average for machine-building as a whole. The volume of machine-building and metalworking products will increase by 40-45 percent during the five-year plan, mainly as a result of an increase of labor productivity and without an increase of consumption of the main types of construction materials.

Intensification of production assumes broad introduction of resource-conserving technologies and those that provide so-called extreme modes of conservation. It is technological conversion of production that is the core of technical reequipping of machine-building enterprises and renovation of them. To implement it successfully, new-generation machines and equipment should in combination ensure implementation for each type of production of entire production systems, distinguished by low operation, trouble-free operation, reliability, flexibility, minimum use of manual labor and automation based on microelectronics. Introduction of them will provide an increase of labor productivity of 2.3-2.5-fold, energy consumption of the national income will be almost two-thirds less and metal consumption will be almost one-half as much.

One of the timely and complex problems faced by machine building is to ensure integrated deliveries of equipment for sectors of the national economy, the same as for technical reequipping of the machine-building industry itself. Solution of it will permit a multiple increase of labor productivity within the shortest deadline and will introduce essentially new, mobile organization of the machine-building industry. It is even more important to solve this problem, since an essentially new class of machines--flexible automated production systems (sections, shops and plants) and flexible production modules based on machine tools with numerical program control and machining centers--have now been developed and are becoming widespread. This equipment can be used successfully only if there are all sections contained in the system. It must be taken into account that an interruption in one section leads to incomplete utilization of the potential capacities of this progressive technology, prolonged idleness of it and leads in the final analysis to a reduction of production efficiency.

The priority of our country is another essentially new class of equipment--rotary and rotary-conveyor lines. Compared to ordinary types of equipment, they provide a tenfold or more increase of labor productivity.

Introduction of the modular principle of design using standardized assemblies and units and flexible technology based on multifunctional machines and equipment, readjusted for changing processes and manufactured products--will contribute to the most rapid embodiment of advanced scientific and technical ideas in new generations of machines and equipment.

Extensive use of multioperation equipment and machine tools with numerical program control, flexible production modules, rotary and rotary-conveyor lines, robot engineering complexes, computer-aided design and automated management systems and ever greater equipping of machine-building products with microprocessor hardware have been called upon to alter the face and internal content of Soviet machine building and to provide a new level of production and qualitative transformation of labor itself. This is even more important, since conversion from automation of individual production processes to integrated mechanization and automation of industry on the basis of "unmanned" technology and automatic self-adjustable computer-controlled production systems is envisioned.

Extensive organizational preparation should precede the use of new production processes and means of automation at each enterprise. For example, it is impossible to begin introduction of flexible machining technology without grouping parts according to the feature of structural-production homogeneity and corresponding organization of their production. Practice indicates useless introduction of it in fragments. Integrated solutions, which mean subordination of the use of new equipment and training of personnel to a single goal--to a significant increase of labor productivity and to improvement of product quality, are required. The experience of the first years of utilizing equipment with numerical program control clearly confirmed this. Thus, where the possibilities and essence of new equipment were not investigated and where people were involved with the machine tools themselves rather than formulation of technology and organization of production using these machine tools, installation of new equipment would not yield the necessary changes and, moreover,

would cause an increase of delays. But equipment supplied with a numerical program control system is only the beginning and an element, not the most complicated one, of a flexible manufacturing system.

The new principles of automation require revolutionary changes in the composition and precision of equipment, provision of its reliability, fundamental changes in organization of production and management of it. Development of a technical policy in design and development of flexible automated plants is envisioned on the basis of development and subsequent copying of standard systems for all sectors of machine-building. Considerable attention is being devoted to fundamental problems of formation of large automatic production systems that combine machining, monitoring-measuring and auxiliary equipment, connected by a branched transport network and controlled by an automatic management service on the basis of modern computers.

For example, production of special equipment has increased threefold during the past decade at enterprises of Minelektrotekhprom [USSR Ministry of the Electrical Engineering Industry and Power Machine-Building]. It will triple during the 12th Five-Year Plan. It is planned to release almost every fifth assembly-line worker during the five-year plan in the automotive industry as a result of assimilation and extensive use of special machine-tool equipment manufactured in the sector, including automatic lines and flexible complexes. These results are achieved on the basis of a planned, economic tie-in of measures with technical reequipping projects. The entire sector structure of economic management--from the ministry to associations, enterprises and organizations--has been infused with this concern. Thus, intrasector machine-tool building will increase 1.8-fold during the new five-year plan at VAZ [Volzhsk Automative Plant]. And this will occur in the presence of powerful production engineering potential which, however, needs reequipping. We have in mind sections with high laboriousness and monotonous labor. The program developed by the association will make it possible to reduce manual operations, to increase the scales of unmanned technology, to double the replacement of obsolescent equipment and to provide conditions for manufacture of modern automobiles.

The billet economy, which largely predetermines the metal consumption of future machines and the degree of automation of all production modifications of the machine-building industry, requires close attention. It includes thousands of enterprises, shops and sections that manufacture more than 34 million tons of blanks. Noting the specific trend toward improvement of the billet base, we cannot be fully satisfied with its condition.

The USSR produces more metal than the United States, but we are inferior in leadership on the output of metal products and primarily due to inefficient use of metal. The structure of machine building is reflected here and, as noted in the press, this situation was also caused by the fact that the basic technology in machine building still remains cutting technology, as a result of which a considerable part of metal goes to chips. The problem of extensive introduction of low-waste methods of shaping parts--by welding, pressure and by precision types of casting--acquires ever more timely significance in this regard.

Important work must also be completed to improve the structure of billet production. Specialization and concentration of billet plants is the primary

direction in this case. Approximately one-third of billet shops and sections in machine building is characterized by low capacity and obsolescent technology. It is natural that labor expenditures and costs here are high and labor productivity is low. High-performance automated equipment and progressive production processes should be introduced in small plants.

Progressive development of billet plants, an increase of the output of precision blanks and accordingly a decrease of metal consumption of machines is hindered by the existing system of planning the production of casting, forgings and stamping on the gross principle.

Methods of selecting the most effective engineering and production decisions both at the design stage and upon orders of specific equipment by enterprises need improvement. As indicated by practice, the main parameters of expensive equipment are rarely utilized by 20-30 percent, which inflicts a considerable economic loss to the national economy. Larger, more powerful machine tools are used in many cases than necessary for production needs. This is especially true of the use of machine tools with numerical program control and robot-automated complexes.

Machine building is the leading factor in development of scientific and technical progress. Its success, as well as difficulties, are reflected directly in development of all sectors of the national economy. The planning organizations, ministries of the chemical industry, ferrous and nonferrous metallurgy and other related ministries must evaluate known contribution from these positions to development of new structural materials and makeup parts and also their production capacities.

Important complex tasks are posed to the sectors of the machine-building complex in the draft of the Basic positions for the economic and social development of the USSR for 1986-1990 and for the period up to 2000. Successful solution of them requires organization of clear work of each sector, each enterprise and association from the first day of the new five-year plan. Such is the objective requirement of time.

6521
CSO: 1823/145

INDUSTRY PLANNING AND ECONOMICS

AUTONOMOUS FINANCING EXPERIMENT AT SUMY MACHINE BUILDING NPO

Moscow PRAVDA in Russian 30 Dec 85 p 2

[Article by Hero of Socialist Labor V. Lukyanenko, General Director of the Sumy Machinebuilding NPO imeni M. V. Frunze, and V. Moskalenko, Deputy General Director of the NPO for Economic Questions: "Moving Forward: The Economic Mechanism"]

[Text] In the concluding year of the five-year plan, the collective of the Sumy Machinebuilding Scientific-Production Association imeni M. V. Frunze is working under full cost accounting conditions, on an autonomous financing basis. An important step has been taken in the search for an improved system of management. The experience they have accumulated is consonant with what is proposed by the draft Basic Directions in section 14: "Strengthen the role of economic methods of management and the role of cost accounting in all links of production."

The large-scale economic experiment has revitalized the economic activity of enterprises. We understand that this process is not complete, that it has weak, as well as strong, aspects. The most substantial of these is, in our view, the fact that, under the experiment conditions, the bulk of the enterprise profit is withdrawn, transferred to the state budget and placed at the disposal of the ministries. In other words, give up what you have earned, and if you find you need it, it will be allocated to you....

But when and how much or if to meet today's needs...you don't know that ahead of time. Given such a procedure, enterprises are in no hurry to use their reserves. Something is kept aside "for tomorrow." The directors are concerned about proving they need to build. Then the funds are allocated. And enormous sums are thus scattered.

The fundamental difference between the Sumy experiment and the large-scale experiment is that our collective has independent access to its own profit. We are currently receiving 62.4 million rubles, which is 33 percent more than last year and four percent more than planned. Now we cannot count on any state subsidies whatsoever. All the collective's hopes ride on itself, on what it earns itself.

And how is the profit being disposed of so as to extract the greatest benefit to both the state and the collective, to lay a reliable foundation for a new

step forward? We are putting 30 kopecks per ruble into the budget in the form of a tax payment. But 70 percent remains at the disposal of the association. This profit is apportioned basically along three primary lines. Upwards of 21 million rubles has been allocated for scientific-technical progress, or, to put it more simply, for continued enterprise development. Nine million rubles has been designated for material incentives, and an almost equal amount is for housing construction and for sociocultural measures.

These figures would obviously be easier to understand were we to add that all our funds currently exceed last year's by a third. And probably most essentially, 30 percent more has also been deducted to the country's budget. In the 12th Five-Year Plan, the normative of deductions to the budget will be increased. In so doing, the priority of payments to the state will increase and the enterprise collective will know in advance how much of the annual profit will be given up and how much will remain here. This will permit our making the best use of it.

"Well, what's new about that?" the skeptics might ask. "Previously, we gave up part of our profit and then took as much as we needed. And now things are essentially the same...."

Not the same at all! Let me repeat: our enterprise has been very profitable for many years, its profits have always been impressive. But, after giving them up, we then received as much as was allowed us and spent it on what was dictated to us. There was no stability, no confidence. We did not know ahead of time when and how much we would be given or to meet what needs. While obtaining a large profit, the collective lived as if on subsidies. What happened was actually a levelling. The ministry "patched holes" at the expense of the leading enterprises, fattening up the laggers.

In the 11th Five-Year Plan, we managed to invest half the funds allocated for capital construction in retooling the enterprise. In doing so, we were in step with the party demands calling for resolutely taking up a path of intensive methods of management.

We carried out the five-year plan in four years and seven months in terms of the basic indicators: 121 million rubles in above-plan profit was received. But even on a background of these successes, 1985 stands alone. Under autonomous-financing conditions, the collective was able to open up new seams of reserves. The rates of growth for all indicators in 1985 will be significantly higher than in the preceding four years. We will be able to invest in retooling as much as is dictated to us by the conditions and by modern production demands. But it thus far remains an open question whether the enterprise will be supplied in full with the material-technical resources.

Here, we are stopped again by the critics, who interrogate us with "If all that is so, then aren't you tempted to get some more orders for output whose manufacture is not labor intensive, but whose cost is high?"

No, the Frunze plant workers are not tempted to do that. And not because we're so intelligent. We supply items strictly on the basis of contracts, which does not allow us to stuff the order file. Time was, when the enterprises counted only the marketing total in rubles, without consideration of the products list.

Now, that is taken strictly into account. Strictly speaking, profit volume depends not so much on profitable or unprofitable orders as on labor productivity, product quality, and reductions in metals intensiveness and net cost.

We ourselves set the incentive supplement for workers in all categories as a function of their creative and labor contribution to the common pot. Neither is there any hint of levelling here. If you achieve the highest labor effectiveness in your own job, keep within the established schedules, produce well-made output and save materials and electricity while doing so, you will receive your full share. If you allow idle time or defects, you'll get less.

There is one important feature of our distribution of the various supplements -- extensive publicity. Neither the accountant nor the shop chief sets the amount of a bonus for any particular worker. Everything is decided by the collective itself, democratically.

The average monthly wage for a worker at the Frunze plant is currently 223 rubles. The level of bonuses for engineering-technical workers averages 50 percent of their basic salaries.

Again, we hear the heckling: aren't those bonuses too generous? I will answer honestly that we are closely monitored by the party and trade union organizations. The incentive amounts, which do differ, must not, as a whole, go beyond reasonable bounds. These are sliding values.

There is one other regulator, the ratio of labor productivity to wages. In our experiment, the rates of labor productivity growth must exceed wage growth twofold. And if that ratio is not met, then a portion of the material incentives funds is directed into financing the construction of housing and cultural or personal-services facilities. For example, this year we built dormitories for young people, a kindergarten for 280 children, a children's clinic, and 170 apartments for young families. Thirteen houses were erected for machine operators on the subsidiary farm, and we built two stockraising farms and a hothouse with 15,000 square meters. The next five-year plan, we intend to allocate at least 12 million rubles annually for the construction of housing and sociocultural measures. There is, however, a serious danger that all these funds will not be provided with all the material resources required.

As concerns the experiment itself, a number of fundamental questions remain unresolved here as well. As before, we are being given an enormous number of indicators. Some are just funny, such as: saw 3,300 cubic meters of lumber, manufacture 25,000 tons of welded metal components and as many tons of forgings, nonferrous castings.... Such regulation is irrelevant under full cost-accounting conditions. It delays scientific-technical progress. For some reason, we don't have the right to write off obsolete machine tools which have been in service for more than 20 years ourselves. The impression is created that we are still not quite trusted. But it is money we earned ourselves, so we're not going to waste it.

The Sumy experiment will be continued throughout the 12th Five-Year Plan. But it has already convinced us that we are on the right path. It must be quickly and boldly disseminated throughout the country. In this connection, we propose

that paragraph 22 of section 14 of the draft Basic Directions, "Broaden the opportunities of enterprises and associations to use their own funds for material incentives to members of the labor collective," be supplemented with the words "systematically introduce into practice the principle of autonomous financing for associations and enterprises." This will also create conditions for changing the economy over to an intensive path of development.

11052
CSO: 1823/093

INDUSTRY PLANNING AND ECONOMICS

PRODUCTION IMPROVEMENTS AT MACHINE-TOOL ASSOCIATION IMENI SVERDLOV

Leningrad LENINGRADSKAYA PRAVDA in Russian 11 Feb 86 p 2

[Article by S. Pochin, special correspondent: "You Only Have to Want to!"]

> [Excerpts] At one point in my acquaintance with the business and concerns of the Machine-Tool Association imeni Sverdlov it occurred to me that it is too bad there is no barometer for fixing fluctuations in the production climate. Were there one, its pointer would probably register "very windy" right now. The wind of positive change has influenced virtually every aspect of life in the firm and has given a push to the development of initiative and the recently approved bureau of the party obkom [oblast committee]: the collective has resolved sharply to increase its production of new-generation machine tools and to bring all its production up to a competetive level in the 12th Five-Year Plan.
>
> In other words, the machine-tool builders have turned sharply off the original path and in the future will take a fundamentally new direction. What is required for this? That is what we are talking about here.

To Surpass Oneself

The OKB [research and development bureau] of machine-tool building is part of the firm. A year ago, within its boundaries, a new department was established--that of long-term design. Its name makes its purpose clear--to determine potential and propose the kinds of machine-tool models that we will not be ashamed to produce.

"And what is necessary just to produce such tools," I ask S.V. Vasilyev, department chief.

"Only to want to!," he answers instantly.

"And that is all?!"

"Yes," the designer confirms his answer with conviction. "If we really want it to, the quality of production will immediately become excellent."

"No worse than the world's best specimens?"

"Again 'no worse'! Why not 'better than'? It is finally time to stop holding ourselves back from the very start!," Stanislav Vasilyevich got more and more excited. "Nothing holds you back," he insisted, "like lack of faith in your own strength. If you really want to achieve something, then ideas will be found, and means will be allotted, and capabilities will be developed, and people found to carry it out."

Vasilyev is a designer, as his comrades say, by calling. Naturally, by nature he is a complete maximalist. Not long ago his opinion would have been "divide" by two, or else by five, in order to imagine what his colleagues were thinking. But today this is no longer required; it seems as though they have all become maximalists. And, clearly, much has already been accomplished thanks to that.

In the words of E.G. Loyev, chief engineer of the firm, they have already developed the same potential for which the department was set up. Moreover, they have begun, with the producers, to carry out the ideas. In assembly shop No 33 they are completing the manufacture of the first model of the new generation, its production timed to the 27th party congress. Also here, assemblers are "concocting" a second specimen, which will be sent, by the way, to a western European country.

"Module"--they still have not even managed to get used to this word like they should. And it is necessary, since we are talking not simply about a machine tool and not simply about a processing center, but about an entire system of equipment that can operate, with a high level of productivity, in conditions of technology with few or even no people. It is the pre-image of a unified series in which is already foreseen at least 13 modifications.

It is not for nothing that we have spoken of the maximalism of the designers. It is as though it was clear to them at the first stages of the assignment: how to design a competetive machine as quickly as possible. But they did not start it, they began right away to develop a series. In order not to complicate matters later with a second machine, a third and a fourth; in order to have a selection of "blocks", varying which they could form various types of modules--turning-boring ones, coordinate ones and coping-cutting ones.

It is curious that at first the firm's directors considered it too risky to threaten the series. And then the members of the "shady office", at that memorable conference, called the risk justified and proposed that the five-year plan program be built on just such a series. Moreover, to set about the development of 15 more modifications on the basis of a module of slightly larger dimensions. In the end it was so decided.

And S.A. Zhidkov, chief designer of the "shady office", who is the leading designer of the series of new modules, threw out an idea to his colleagues. Together with Vasilyev, he polished unbeatable arguments ahead of time, and these settled the dispute. Clipping their wings some with the unification of the modules, the designers proposed a huge advantage for the production. The shops would not have to process, as now, an avalanche of 60,000 types of parts! The inventory would shrink 2-3-fold, and the cycle of modernizing production accelerate by that same 2-3-fold.

They really began to think differently from before, always looking a few steps ahead. Thinking not only about their own, immediate profit, but also about the effect on partners. The number of like-thinkers increased not only at the upper levels of the directorate.

And how could the assembly of the new modules otherwise have been begun only a year after the beginning of their design. According to the norm, at least three years or so should have been spent on this cycle. But here the designers, technicians and producers began to work in parallel. Drawings were still not ready for all the assemblies and the technology was already being developed. Besides that, there was clearly no documentation, and workers were already turning parts.

To Remember

In the 10th and 11th five-year plans the machine-tool association was able to spend about 15 million rubles on retooling. In essence, this money was enough only to patch holes--to replace worn out machines and expand "narrow" sectors. The firm had practically no means for reconstruction. The ministry allotted them to those who could give a quick return and who had a solid supply of ideas. For example, to the Ivanovskiy Machine-Tool Association.

And this five-year plan the firm is planning 60 million rubles worth of capital investments. For decisive renovation of shops, establishment of flexible production systems capable of producing 200-300 modules per year. Remember: you have to want to, and ideas and means for carrying them out will be found. And so it happened. In renovating production, the collective plans, during the five-year plan, to increase its volumes 1.7-fold and to increase efficiency from the use of their products in the national economy by almost [illegible]-fold. Relying only on the leading equipment, it is possible to make such plans. And another important circumstance is the design of this equipment oriented primarily toward the use of domestic components to the exclusion of imported "injections".

12461
CSO: 1823/128

INDUSTRY PLANNING AND ECONOMICS

BALMONT INTERVIEW ON CEMA 'INTERROBOT' NPO

Moscow IZVESTIYA in Russian 23 Dec 85 p 2

[Interview with USSR Minister of Machine Tool and Tool Building Industry B. V. Balmont by IZVESTIYA science reviewer B. Konovalov: "The Start of 'Interrobot', A New Form of CEMA Member-Nation Scientific-Technical Cooperation"; date and place not given]

[Question] Boris Vladimirovich, at the 41st (extraordinary) session meeting of the Council of Economic Mutual Assistance, an agreement was signed on instituting an international "Interrobot" NPO [scientific-production association]. Why was the first multilateral NPO created now, and what are the objective reasons for it?

[Answer] This is a natural step towards intensifying the economic integration of the fraternal socialist states. The comprehensive program of scientific-technical progress of CEMA member-nations up to 2000 singled out the priority directions most important to developing the economy. One of them is comprehensive automation, including the extensive use of flexible manufacturing systems and robot equipment.

The number of machine tools already exceeds the number of available machine tool operators in our country, for example. In order to fundamentally increase labor productivity in machinebuilding and simultaneously solve social problems, we must change over to technology using fewer people and to the extensive use of robot equipment.

Unfortunately, the advantages of socialist integration have not been fully used in creating robot equipment; each country has tried to do everything itself. As a result, although the production functions of robots of the same type do not differ, their designs do differ in, let's say, Bulgaria, Hungary and our country. Moreover, robots designated as being of the same type but produced by different branches in one country, ours, for example, differ substantially and consist of different sets of assembly components.

When the scale of robot production was small, perhaps one could reconcile himself to such a "natural economy." Now that a tremendous demand for robots has arisen, we need to unitize and standardize their design and specialize and cooperate in their production.

[Question] You spoke of the necessity of changing over to technology using fewer people. From that point of view, it is especially important to ensure that robots function reliably. In fact, they are basically designed to work as part of automated complexes. What are the minimal demands on robot reliability today?

[Answer] You are right. At first, bachelor robots, if you can call them that, were popular. But is soon became obvious that this is not their primary purpose. Robots are finding their broadest application in flexible manufacturing systems, which have now become the mainline of machinebuilding production automation. Flexible systems permit rapid readjustment to produce new output, which is of enormous importance these days.

In this area, we intend to combine our efforts on the basis of the previously signed general agreement by CEMA nations on multilateral cooperation in developing and organizing the consolidated production of flexible manufacturing systems for machinebuilding. This year, we have created an international CEMA member-nation coordination council for flexible manufacturing systems development. It is headed by N. A. Panichev, USSR First Deputy Minister of Machine Tool and Tool Building Industry. And many of the requirements of robot equipment, including their reliability, must be determined from the general operating conditions of flexible manufacturing systems.

The minimum requirement of robot reliability is uninterrupted operation for two to 2.5 shifts. This provides an opportunity to set up the systems and do the preventive maintenance on them during the first shift and to then operate the equipment without human interference for the next two shifts. One of the basic tasks of the "Interrobot" association is to create equipment which is this reliable.

[Question] Tell us, please, what the scientific-technical policy of the "Interrobot" will be. How will it be implemented in practice?

[Answer] The primary task facing "Interrobot" is to direct new developments into a single channel. To do this, the efforts of designers and developers of robot equipment in all the CEMA countries which have signed the agreement will be combined. Their top-priority task will be to work out new robot equipment requirements which will guarantee world leadership. We are also faced with determining the necessary standardization series of promising robots, with effecting the module-unit principle of designing and unitizing assembly components, with organizing a more efficient international division of labor. The specific implementers -- institutes, design bureaus, enterprises -- must be determined.

The national programs of all the CEMA member-nations signing the agreement must be subordinated to this overall task. In our country, this work has already begun. The "Robot" interbranch scientific-technical complex has been organized under the Ministry of Machine Tool and Tool Building Industry in conformity with the USSR Council of Ministers and CPSU Central Committee decree. Its lead organization will be the Experimental Scientific Research Institute of Metal-Cutting Machine Tools [ENIMS] of the Ministry of Machine Tool and Tool

Building Industry. The complex will include the Ukrainian Scientific Research Institute of Machine Tools and Tools, which is now oriented practically exclusively towards the robot engineering problem, the "Stankokonstruktsiya" plant in Moscow, and also the Mukachevskiy Machine Tool Manufacturing Plant and the Sterlitamakskiy High-Precision Machine Tools Plant of the Ministry of Machine Tool and Tool Building Industry, which produce robots. Institutes of the USSR Academy of Sciences, organizations and enterprises of the Ministry of Instrument Making, Automation Equipment and Control Systems, Ministry of Electrical Equipment Industry, Ministry of Heavy and Transport Machinebuilding, Ministry of Automotive Industry and Ministry of Higher and Secondary Specialized Education are participating in the "Robot" MNTK. They will all be operating under a unified plan.

This powerful national complex will ensure scientific research, experimental design development, the release of lead models and small series of robot equipment, testing, and the development of requirements for training the personnel which will have to deal with operating it after mass production begins.

Analogous centers performing the exact same functions must be created in all the countries taking part in "Interrobot". And they, too, must implement in practice, the unified scientific-technical policy being developed.

[Question] How will management of the "Interrobot" scientific and technical developments be set up? What does 'international division of labor' mean today?

[Answer] An "Interrobot" board and council of chief designers will be set up to run joint developments.

Each national center, headed by its own chief designer, must work on the coordinated program independently. Specialists from other CEMA countries can be enlisted in this work and joint collectives of designers can be created. For example, a joint Soviet-Czech International "Robot" Scientific-Technical Association will take part in implementing its portion of the multilateral program.

An international division of labor has laready been preliminarily outlined. Thus, Bulgaria, say, will be specialized to develop robots for applying coatings and assembling individual machinebuilding and electronics items. Hungary will be specialized to design robots for monitoring-measuring operations and for assembling instruments. Poland -- welding, Czechoslovakia -- machines for die casting and assembly. The Soviet Union will take on robots for metalworking and casting equipment. Moreover, each country will be specialized to produce a particular type of assembly component. In the process of developing a unified scientific-technical policy, the specialization of the individual countries will have to be refined.

When a new robot has been developed and tested, the board of the international NPO will provide recommendations on the most appropriate producer for it. This could be either a national enterprise or an international one of the Soviet-Bulgarian machine tool manufacturing NPO type, which have large series-production plants.

[Question] What real advantages do you expect from "Interrobot"?

[Answer] The primary advantage will be the fuller and more effective use of scientific-technical potential of CEMA member-nations. This will accelerate development and permit development at a high, world level. And, of course, there are the enormous advantages the CEMA member-nations will then receive by the introduction of these new developments into mass production.

Enterprises will be able to set up the large-series, automated release of one or several units to be used to assemble the robots, and the remaining units needed for a complete set will be obtained from other enterprises in exchange for supplying their own. Such cooperation might be national or it might be international. Large-series production will permit a reduction in the price of assembly components, meaning in the price of the robots as well, and this will expand their sphere of application. Unitizing robots and control systems will make their operation considerably easier. This is also very important.

Characteristically, the agreement has been signed by Cuba, which is only just beginning to develop its own machinebuilding. This will provide it with an opportunity to link up to advanced technology immediately and to train the necessary personnel.

All this will enable the socialist countries which have signed the agreement to save human , financial and material resources. And production of the new equipment will ensure labor productivity growth and the resolution of important social problems. Each of the fraternal countries and all of us together will benefit.

11052
CSO: 1823/092

INDUSTRY PLANNING AND ECONOMICS

EDITORIAL STRESSES NECESSITY OF IMPROVING EFFICIENCY

Moscow MASHINOSTROITEL in Russian No 12, Dec 85 pp 1-2

[Unsigned Editorial: "Much Work Ahead"]

[Text] The October (1985) CPSU Central Committee Plenum discussed the draft of the new edition of the Program of the Communist Party of the Soviet Union, the changes in the CPSU Rules and the draft Basic Directions of USSR Economic and Social Development for 1986-1990 and Up To 2000. The core of these three documents is the principle of accelerating socioeconomic development in our society. The formula expressing the essence of contemporary party policy is the attainment of a qualitatively new condition of Soviet society through accelerated socioeconomic development.

"We are faced," states the draft of the new edition of the Program of the Communist Party of the Soviet Union, "with achieving significant labor productivity improvement on the basis of accelerating scientific-technical progress, fundamental transformations in equipment and technology, and mobilization of all technical, organizational, economic and social factors. Without this, as V. I. Lenin taught, 'the final transition to communism is impossible'. Increasing labor productivity 2.3- to 2.5-fold in the forthcoming 15-year period is being planned as the new frontier."

In the new five-year plan, the increment in national income and output of all branches of material production will for the first time be obtained exclusively through increased labor productivity. The key role in accelerating scientific-technical progress in the national economy belongs to machinebuilding. Accelerating the rates of growth in Soviet machinebuilding is the mainline direction of development for the future, the basis of scientific-technical progress in all branches of the national economy and of keeping the country's defense capability at the necessary level. Machinebuilding is called upon to produce systems and complexes of machinery, equipment and instruments at the highest technical-economic level, at a level ensuring revolutionary changes in production organization and technology, many-fold increase in labor productivity, reduced materials- and energy-intensiveness, improved product quality and better return on capital. It is therefore necessary, even in the 12th Five-Year Plan, to raise the rates of labor productivity growth 1.5- to two-fold and ensure the mass production of new generations of equipment which will ensure automation and robotization of the production process and a many-fold increase in labor productivity.

Flexible manufacturing systems (FMS) are a striking example of the fundamentally new means of production in machinebuilding. Their introduction makes is feasible for machinebuilding to increase labor productivity not by several percentage points, but many-fold.

Machine tool manufacturing, electrical equipment industry, micro-electronics, computer equipment and instrument manufacturing, and the whole information science industry must receive priority development as the true catalysts in accelerating scientific-technical progress.

In the new five-year period, the rates of machine tool manufacturing development must be considerably higher than those which have been achieved. Branch enterprises are faced during the 12th Five-Year Plan with more than doubling the production of NC machine tools and increasing machining center production more than five-fold, with fully satisfying the demand for them in the national economy. The manufacture of flexible modules will grow 2.3-fold, of FMS -- 5.3-fold, and of automatic and semiautomatic machine tool lines -- by 43 percent. And the production of progressive tools for that equipment will be increased sharply. In turn, machine tool manufacturing itself must be technically and technologically re-equipped so as to emerge at a qualitatively new level.

Are our machine tool builders up to these tasks? Without question, they are. This is confirmed by the experience of the flagships of the branch, production associations such as the "Krasnyy proletariy" and automatic lines and special machine tools in Moscow, the Ivanovsk imeni 50th anniversary of the USSR, the Kiev and Ryazan machine tool manufacturing and Voronezh heavy-duty mechanical presses and the Tiraspol Foundry Machinery Plant imeni S. M. Kirov. Their experience should be made available to all our collectives.

In implementing party policy of accelerating socioeconomic development, full use of the available reserves for saving material resources is of important significance. Given the present scale of our national economy, just a one-percent reduction in expenditures of fuel, raw and other materials permits nearly a seven billion ruble increase in national income. These funds could build several industrial giants or approximately a million new apartments.

Unfortunately, by no means all the opportunities for saving a majority of the material resources are being fully used. At many enterprises, significantly more energy, metal and other material resources are being used to produce a unit of output than at the best domestic and foreign enterprises. In the 12th Five-Year Plan, machinebuilders will be faced with the tasks of radically improving the technical level and quality indicators of the output being produced by increasing reliability and service life for the most important types of output by 25-30 percent. There are enough prerequisites for reducing the specific metals intensiveness of machinery and equipment by 15-20 percent and increasing their fuel and energy economy by 10-15 percent.

The party has set us the task of achieving a sharp breakthrough in resources conservation. Some 75-80 percent of the increment in national economic fuel, raw and other material requirements must be met by saving resources. And the leading enterprises have been achieving their increases in output needed by the

country with lower resources expenditures. The collective at the "AvtoVAZ" association, for example, has taken on an obligation to manufacture 150 million rubles worth of output above the control assignments without drawing down additional rolled metal resources in the forthcoming five-year plan.

Steps to raise the technical level of production and educational work in the labor collectives must now be aimed at economy and thrift. Equally important is effective monitoring of the protection of socialist property, the proper storage and use of all types of resources for their intended purpose, and a resolute struggle against mismanagement and squandering. In this regard, skillful use must be made of material incentives so as to create among all workers a direct interest in saving and increased responsibility for overexpenditures of raw and other materials, fuel and energy.

Qualitative transformation of the material-technical base will require improvement in investment and structural policies in the economy. This signifies that production renovation and retooling on the basis of new and advanced equipment must occupy a central place in capital investment in the national economy in the new five-year plan. The share of funds being directed for these purposes must be increased from one-third to at least one-half the total amount of production capital investment.

The plan for the 12th Five-Year Plan lays the foundation for an appreciable shift towards efficiency. Perfecting planning and management and methods of administration, improving work organization, strengthening discipline and responsibility in all sectors, and comprehensive development of the creative initiative of the masses have now acquired particular importance.

Socialist competition has served and will now serve as the most important manifestation of a genuinely creative, innovative attitude towards work. It has always been an effective method of developing productive forces, perfecting production relations, educating workers and involving them in production management.

"The development of socialist competiton is an object of constant party attention," the draft Program notes. "This is the most important sphere of development of the creativity of the workers, one of the main methods of self-affirmation and social recognition of the individual. Relying on Leninist principles, it is necessary to perfect the organization and increase the effectiveness of competition, to outlive formalism and patterned thinking, to disseminate leading experience more widely, to pull laggers up to the level of leaders, to develop a spirit of initiative, comradely cooperation and mutual assistance. Full support of the initiative and creativity of the masses aimed at accelerating scientific-technical progress, labor productivity growth, the thrifty use of resources, increasing production efficiency and improving product quality, lowering product net cost, ensuring a precise labor rhythm and prompt meeting of contractual obligations, and the achievement of the best national economic end results are now of the most important significance."

However, socialist competition organization does not fully correspond to the spirit of the times, to those genuinely innovative plans being put forward by

the party in the forthcoming five-year plan, in a number of organizations and enterprises. This results first of all from the fact that not everyone has yet rejected the inertia of the old ways or their attachment to extensive economic management, from the fact that not everyone has turned out to be psychologically prepared to work under the new conditions. In fact, it is no accident that socialist competition in many collectives is moving along on its own accord, without being firmly and deeply linked to work on transferring the economy to intensive tracks, to accelerating scientific-technical progress, to restructuring the economic mechanism, to the widespread introduction of collective forms of labor organization.

But we do have someone to use as a model, someone to try to equal. For several years now, laborers at the "Kriogenmash" NPO in Balashikha have proven what important results will be achieved by daily concern for constantly retooling production, producing quality output, and the thrifty use of all the material resources they use. The current successes of the workers, engineers and scientists of this association are correctly related, in a state-oriented manner, to the planned frontiers, to high, taut goals for the future, to the 12th Five-Year Plan. This is convincingly indicated by the increased socialist obligations taken on by the Kriogenmash workers in honor of the forthcoming CPSU Congress.

Greeting the 27th Congress of our Leninist Party in a worthy manner is the most immediate practical and political task. All organizational, political and economic efforts, all the energy of the labor collectives, must be concentrated on its resolution, as was indicated at the October CPSU Central Committee Plenum.

11052
CSO: 1823/105

INDUSTRY PLANNING AND ECONOMICS

ADVANTAGES OF FLEXIBLE PRODUCTION SYSTEMS DISCUSSED

Moscow PLANNOVOYE KHOZYAYSTVO in Russian No 12, Dec 85 pp 88-89

[Article by V. Vasilyev, member of the State Committee for Science and Technology and candidate of technical sciences: "On the Question of the Conditions for the Intensification of Machine Building Production: Returning to the Article in the Journal"]

[Text] The problems raised in the article by G.A. Kulagin, "On Some Conditions for the Intensification of Machine Building Production," are very pressing in the contemporary stage of the development of domestic and world machine building. (Footnote 1) (see PLANNOVOYE KHOZYAYSTVO, No 7, 1985) The article justifiably notes that in concentrating the considerable forces of research institutes, VUZ's and enterprises for the creation of the latest technology, the proper attention is essentially not being paid to organizational and economic aspects of its utilization. It is properly emphasized that the main thing is not the shortcomings of GPS [Flexible Production System(s)] but the necessity of getting the fullest yield from the entire potential of the new technology and, we add, of correctly understanding and disclosing all of the possibilities of flexible systems. In the article, GPS's are seen more as an evolutionary development of traditional production than as a revolutionary improvement, making it possible to resolve the contradiction between the mobility of machine building and the increase in labor productivity and determining the urgency of a fundamental review of traditional approaches in the organization and technology of machine building production.

The high reliability of the work of equipment and electronic components, the heightening of specialization and cooperation, the timely delivery of semifinished products, the smoothness of plan fulfillment during the course of the month, the full load on equipment, and the improvement of the price-setting policy for new equipment are all very important requirements in raising the efficiency of machine building production and increasing labor productivity on the basis of both traditional as well as the latest equipment and technology. In this, GPS differ neither from universal lathes nor from automatic lines.

But flexible systems can be used during the night shift with a minimum number of people or even without people, whereas universal lathes require a huge

number of workers day and night. Whereas universal lathes are now loaded no more than 600 to 700 hours a year, GPS can potentially machine parts 6,000 to 7,000 hours annually (with the same losses of time for the preparation of tools and equipment and working round the clock and throughout the year). There are instances in world practice where such expensive equipment as flexible systems pays for itself in 2 to 2.5 years.

In the comparison of the cost of universal lathes and flexible systems, there are examples in favor of the latter. Thus, the GPS of the French firm Citroen for the small-series production of parts of experimental automobile models costs 35.5 million French francs, including 23 million francs for machine tools and equipment. The cost of the necessary number of machine tools and equipment for the production of the same volume of output by traditional means would come to 39 million francs, of which 32 million would be required for the machine tools alone.

In comparing the cost of universal lathes and GSP, one also needs to consider cutting tools and not just the quantity but also the type. The firm Yamazaki (Japan), for example, needed only 76 types of cutting tools to machine parts in its GPS instead of the 400 to 500 different cutting tools perviously used in traditional production. The result is that the utilization of each tool becomes many times more intensive (there are also costs associated with its lying around the stockroom!), which one must not fail to take into account.

And the increase in labor productivity? Experience in the operation of the domestic system KAPRI (complex automation, planning and utilization) shows that labor productivity rises by a factor of 10 in the preparation of detailed drawings and by a factor of 15 in the development of production processes and that overall the labor of a designer is twice as productive and that of a production engineer is more productive by a factor of 1.6. And this is in the manufacture of simple parts and in experimental production.

There are also other areas of economy such as the reduction of the time for the entire production cycle to one-thirtieth of the original amount by using a GPS. This is an overall indicator and the result is that the saving is achieved in many categories of expenditures. Thus, in the manufacture of the horizontal OTs [Machining Center] of type N-20 of the Yamazaki firm, 3 months were needed for the machining of the components, 4 weeks for assembly, and 1 week for adjusting and testing, that is, less than 4.5 months altogether. After assimiliation, the manufacture of the components of the same OTs required 4 days, assembly 2 weeks, and adjusting and testing 1 week, or a total of 4 weeks. These are the potential possibilities of flexible systems that must be utilized. The author of the mentioned article also sees in all of this the main effect of contemporary GPS and gives an almost complete enumeration of their advantages but he does not consider them in this own calculations.

Within the limits of the technical characteristics and technological purpose of the machine tools and equipment included in them, GPS are capable of machining components of any products list and not just the same output with different parameters. All of this can be done on a series universal lathe and on an OTs based upon it but much more can be done at a unique machining

center. The turning OTs's of the Japanese GPS "System 21" (Yamazaki firm) are utilized not only for machining parts of the revolving bodies type but also comonents of the levers and planks type. In addition, the flexibility of the GPS is a more complex concept than the flexibility of the OTs's included in it.

G.A. Kulagin is right in regard to the uncertain orientation of young people in choosing an occupation. But what is the reason for the appearance of occupations without prestige? Indeed, miners, builders, repair workers, turners, tool makers and many other occupations will be needed for a long time to come. GPS and especially GAP [Flexible Manufacturing System(s)] will not appear one morning at all plants at the same time. The path to them is long but correct and requires the revelation of the prospect of change in the content and nature of the activity of workers and engineers. But not only this determines the prestige of labor. A substantial role is also played by satisfaction from participating in creative work and by economic incentives and wages.

It is, of course, necessary not simply to correct methods now in effect but rather to establish a method for determining the economic efficiency of GPS, taking into account the full extent of expenditures and savings in all classes and sectors of production. Also important are recommendations on the concentration of the output of similar products on the basis of group machining methods, which increases the efficiency of both traditional production and GPS. This is the path of the unification of components and subassemblies, standardization of products, and specialization and cooperaton, which govern the intensification of machine building.

9746
CSO: 1823/100

INDUSTRY PLANNING AND ECONOMICS

TYPICAL PROBLEMS, FRUSTRATIONS WITH PLANT MODERNIZATION VIEWED

Moscow SOVETSKAYA ROSSIYA in Russian 3 Dec 85 pp 1-2

[Article by V. Avdevich (Kolomna) under the rubric "What Hampers Work In the New Way": "Director Not Welcoming Innovators"]

[Text] The Kolomna Machine Tool Manufacturing Association is specialized to produce heavy-duty machine tools and forge-press machines, for which the national economy is experiencing a critical need. However, for 15 years now, the plant has not been able to keep up with the growing requirements of industry, meeting orders by only 60 percent. The technical level of the production also leaves much to be desired. Over the past five years, the proportion of output in the highest quality category has dropped by 15 percent. What is hampering the collective in reaching new levels of quality?

...General Director Nikolay Aleksandrovich Lobanov takes some satisfaction in showing guests the enterprise's technical achievements. In one shop, you can see a very unusual machine tool. Both its size and the unusual arrangement of subassemblies attract attention.

"Single-pillar vertical boring and turning machine with numerical programmed control," says N. Lobanov, introducing us. "We are shipping it to 'Atommash'. It will machine nuclear reactor parts weighing up to 500 tons and up to 22 meters in diameter."

Everything in the shop is interesting: the only hydraulic stamping press of its kind, a special programmed multitool milling machine capable of performing three operations simultaneously and automatically.... The director was, as they say, "showing off."

The trip made a favorable impression. But then a situation cropped up which spoiled the whole "barrel of apples." It turned out that the output ready for shipment had been made to individual order and was one-of-a-kind. Unique machining tools account for 30 percent of the plant production program. The remainder of the output is very ordinary multipurpose machine tools. N. Lobanov is reluctant to talk about them. After all, who would boast of yesterday's technology? For example, the model 1550 vertical boring and turning machine has not been current for a quarter of a century. And the model KU-80L is also obsolete. Hundreds of units are shipped out each year to the far ends of the country, increasing the number of work stations.

"Why stop producing them if the customers don't reject them?" asks N. Lobanov.

And it's true, there are a lot of orders for the heavy-duty multipurpose machine tools. But this is to be explained not at all by the popularity of this obsolete equipment: there's simply no other choice. What is hampering setting up series production of more-progressive machine tools? There is a contradiction: on the one hand, a powerful creative potential has been created at the plant and on the other, the consumers at large continue to receive obsolete output. A year ago, the plant manufactured prototype "machining center" boring machines and vertical turning and boring lathes. This equipment is considered by experts to be, without question, progressive, equal to or better than the best in the world. But they haven't been able to set up its series production.

"We don't have the programmed control and drive systems," explains N. Lobanov. "Our suppliers, enterprises of the Ministry of Instrument Making, Automation Equipment and Control Systems and the Ministry of Electrical Equipment Industry, have let us down. They're the ones you should ask...."

The suppliers are in fact not keeping up with the demand. But is that the main problem? This promising model has been sidetracked from production for more than a year, but the plant leadership has not appeared to be particularly concerned, has not pressured its partners or resorted to the courts. Why such passivity? Organizational sluggishness? Something else, I think. In terms of its technical level, the new model far outstrips not only the machine tools in production, but also the production-technical base of the enterprise, which has long needed renovation.

....The large-parts shop is the main shop in the plant. The many huge machine tools and piles of parts weighing many tons each make it a dark, shadowy place. Shop chief A. Shatskov stops beside each fifth boring machine, each turret-type machine, each slitter-planer, and says bitterly: 50 years old, 45, 40....

"This is the equipment I have," he sums up. "The leadership knows only one thing, however: meet the plan, give me the productivity.... But how can I if, for example, more than half a month goes into manufacturing the base for a 17-ton milling machine? There are so many technological operations that they have to be done on eight units; it takes nearly three dozen workers to turn the parts over and refasten them...."

"Perhaps there's another way?"

"Of course there is!" says A. Shatskov, with some heat. "Were an automated machining complex installed in the shop, it alone would replace eight of my machine tools, reduce the number of workers three-fold and accelerate manufacture of the parts two-fold...."

The large-parts shop is not the only shop at the Kolomna plant with old-fashioned equipment. There is quite a bit of it elsewhere: a fourth of the equipment used in production was manufactured half a century ago. The obsolete, worn out machine tools retard plant development and negatively impact product quality. Over the last 15 years, the average annual rates of production growth have been two-fold below those planned.

So, the shops must be retooled in order to change over to the release of the latest models of machine tool equipment. Why, then, are there so few traces of renovation?

Nikolay Aleksandrovich Lobanov picks up a pencil and piece of paper, makes a column of figures and begins commenting on them: "In order to get the prototype machining centers into series production, I have to replace more than 300 obsolete machine tools: disassemble the old machines, make bases for the new ones, install 200 pieces of modern equipment. And I have to do it in 2-3 years without stopping production. Theoretically, it's possible, but in practice, the planned program would not be carried out. The Ministry of Machine Tools and Tool Building Industry would, of course, react: a reprimand for me, reduced incentives funds for the enterprise. Let's talk about it some more. In terms of complexity, the prototypes significantly exceed the level of the output currently being produced. My guess is that it would take at least two years before the 1,500 machine tool operators would have fully mastered the new operations. This means you can't count on the planned rates of labor productivity growth. Again, losses to the incentives funds. The personnel situation is exacerbated. Even now, the plant is short 400 people. What about tomorrow? The enterprise will no longer be a leader, but a lagger. Both prestige and authority will be lost.

It isn't hard to see where his interests lie: the plant first, the state second. N. Lobanov isn't ready to change that order. And why risk it, if the director's opinion is that things are just fine at the enterprise as it is? Over the past four years, for example, the collective has been paid bonuses totalling nearly 10 million rubles.

"Deserved rewards!" the director assumes. "We always meet the commodity output plan and that is noted...."

In ruble terms, the plan actually is stable. They make their money off those same heavy machine tools manufactured to individual order. They make three times less of them, but receive considerably more in income from them from all the series-produced machines taken together. It is precisely this which sustains the material well-being of the collective. Both the workers and the specialists at the Kolomna plant are accustomed to it.

...Nikolay Aleksandrovich Lobanov came to the enterprise 30 years ago after graduating from the institute. He was a foreman, designer, chief technologist. He earned authority and respect by his sensible, energetic work. He was elected secretary of the party committee. As we see, he is not experienced in supervisory work. But the capital of experience is valuable when it is put into circulation and makes a tangible contribution. But all of N. Lobanov's managerial wisdom reduces to demonstrating shock-work fulfillment of assignments. And this is the style he has taught his subordinates. Planned well-being feeds a sense of self-satisfaction and placidity: "Let well enough alone."

N. Lobanov's position is understandable psychologically: he can't conquer himself, the many years of inertia that have evolved his management style. This means a style impetus from without is needed. But what about the ministry? Surely they see and understand that the Kolomna plant can't get by without

changes. They see, and they understand. But the urge to action is weak. In April of 1981, B. Balmont, the Minister of Machine Tool and Tool Building Industry, approved "Measures to Improve the Work of the Kolomna Machine Tool Manufacturing Plant." A separate section in the document dealt with retooling. Four years have passed. And the result? A quarter of the points remain not carried out. It is as if this has gone unnoticed at branch headquarters. In April of 1983, First Deputy Minister N. Panichev visited Kolomna. After analyzing the situation, he suggested that plant specialists immediately work out a plan for retooling three main shops. A document was leisurely prepared and was released a year later. Nothing has been done about it yet....

"Why are you surprised?" says N. Lobanov, angrily. "The cause must be sought not at the plant or at the ministry, but in the economic mechanism currently in effect. It is imperfect in that it provides little incentives to managers for retooling, for producing new output...."

True. That's why the draft Basic Directions state the demand for "comprehensive development of the management and administration system.... targeting this system for a decisive transition to the use of intensive factors of production development, at accelerating scientific-technical progress." But I should like to add several other considerations. Such as that references to an imperfect economic mechanism have become a convenient screen between certain administrators and innovative searching. Why, given identical conditions, are some bold, enthusiastic and willing to gamble by embarking on a difficult path of innovation, while others, like N. Lobanov, prefer to wait placidly for some long-awaited levers and incentives to be given to them? It was emphasized at the meeting on questions of accelerating scientific-technical progress that none of the problems which should be solved today can be put off until tomorrow. We must not delay or bide our time; there is no more time to "get in the swing of things," the past has used it up. Today, a moral climate favorable to bold and decisive economic decisions is being created in the country. But the example of the deserving and respected director, Nikolay Aleksandrovich Lobanov, proves that even an experienced leader finds it hard to admit the necessity for change. Today's well-being, of which the Kolomna machine tool builders are proud, is an imaginary well-being. Admitting the necessity for change means a preference for national economic interests over bureaucratic and branch interests. Herein lies the political meaning of management.

11052
CSO: 1823/098

INDUSTRY PLANNING AND ECONOMICS

IMPROVEMENT OF QUALITY WITH REDUCTION OF RAW MATERIAL EXPENDITURES

Minsk NARODNOYE KHOZYAYSTVO BELORUSSII in Russian No 11, Nov 85 pp 6-10

[Article by V. Burtyl, secretary of party committee of Minsk Production Association for Production of Broaching Machines and Cutoff Lathes imeni S. M. Kirov: "With Least Expenditures"]

[Excerpts] How to achieve the best final results with the least expenditures of raw material, materials and energy? This question now disturbs every shop party organization and every brigade of the Minsk Machine-Tool Building Plant imeni S. M. Kirov. It is planned to conserve 530 tons of metal, 400,000 kilowatt-hours of electric power, 1,100 gigacalories of thermal energy and 100,000 tons of conventional fuel above the established plan during the final year of the five-year plan, which will make it possible to work for 2 days on the conserved raw material and fuel.

Measures to improve the style of work and to intensify monitoring of administration activity over economical management of production are intended in the future plan of the party committee. Problems of efficient use of raw materials and materials are regularly brought up at meetings of the party committee and at open party meetings in the shops and sections. The following integrated programs "Intensification," which encompasses the basic directions of work to improve production efficiency on the basis of scientific and technical progress, and "Energy," which envisions measures to renovate obsolescent equipment and to replace it with more modern and economical equipment have been worked out at the plant with regard to proposals advanced at these meetings. I feel that there should first be a few words about the results of work at the finish of the five-year plan and about our prospects.

The plant provides the entire increase of commercial product under conditions of an economic experiment at the expense of an increase of labor productivity. All contract pledges for deliveries have been fulfilled and an additional profit worth more than 50,000 rubles has been achieved for the 6 months alone by reducing product cost. The collective of the association is faced with crucial tasks during the 12th five-year plan. The rates of growth of commercial products is planned for a 32-percent increase. This can be achieved only by intensive development of production, acceleration of scientific and technical progress, improvement of management and planning, clear organization of labor, determination and more complete utilization of all available reserves and

improvement of the structure of the manufactured product. It is planned in the future to reduce the output of serial products and to increase the production of special machine tools, robot complexes and automatic lines.

Development and assimilation of a new standardized range of broaching machines is now being completed: documentation has been worked out for 29 of 45 models, more than 20 experimental models have been manufactured and industrial production of 13 models has begun, which comprise the main volume of industrial production of broaching machines.

The increase of the performance is achieved by increasing cutting speed (up to 25-40 m/min instead of the previous 13 m/min) and of tractive forces that provide maximum concentration of operations on a single machine tool and multistation machining.

Automation of broaching machines and increasing the output of automatic machine tools is now the basic direction in the technical policy of the Association imeni S. M. Kirov. Beginning with the last five-year plan, we are producing only automatic and semiautomatic machines. Whereas automatic machine tools comprised only 35 percent of the total manufactured special machine tools in 1980, they comprised 65 percent last year and we have pledged to bring production of automatic machine tools to 70 percent this year. Many of them are equipped with manipulators. Introduction of vertical broaching machines with automatic manipulators at our plant ensures a 1.7-2-fold increase of performance and releases approximately 80 machine tool workers. The saving is more than 2 million rubles.

Work is continuing to develop equipment for automation of the billet production of machine-building enterprises. A total of 60 automated billet-cutting sections of a planned 83 sections has now been manufactured. Introduction of these sections will release 260 machine tool workers, will provide a 1.6-fold increase of performance, production areas will be almost one-fourth to one-half as much and production skill in billet shops will increase sharply.

The next phase is to develop a computer-controlled automated billet-cutoff section based on the SM4 computer complex. Introduction of these sections will permit one to automate calculation of the billet shock program, to issue the job to the shop for 1 month, 10-day period or shift, to perform rational computation of the number of billets and to minor fulfillment of the shift job and presence of billets in the warehouse. We consider these sections as one of the promising directions in improving the efficiency of billet plants.

Problems of improvement of technology, mechanization and automation are reflected in the plan for introduction of new equipment and measures of the integrated program "Intensification." A total of 39 machine tools with numerical program control and "machining centers," 13 special machine tools and automatic machine tools, 17 automatic and balanced manipulators, 6 mechanized warehouses, 166 high-performance outfitting units and so on were introduced as a result of implementing it. The new equipment is usually more economical and creates the best conditions for efficient use of labor and material resources. The laboriousness of manufactured product was reduced by 470,400 norm-hours, 2,434 tons of metal were conserved, 4,947,000 kilowatt-hours of electric

energy were conserved, 8,993 gigacalories of thermal energy were conserved, 820 tons of conventional fuel were conserved and a saving of 1.416 million rubles was achieved during the five-year plan as a whole. A total of 198 persons was conditionally released, 44 manual workers were transferred to mechanized labor, the level of mechanization of production processes was increased from 81.8 to 84.6 percent in basic production and it was increased from 64.2 to 68.4 percent in auxiliary production.

The major direction in the activity of the collective of our association was an increase of the technical level and competitiveness of metalworking equipment and tools. The efforts of all subdivisions and services and the energy of specialists and workers are directed toward fulfillment of this task. This was reflected in the initiative of the collectives of the technical services, SKB [special design office] of broaching machine tools and also of the welded assembled steel section and forging-billet shop, which decided to increase the volume of production during this five-year plan without increasing the consumption of rolled metal and fuel and energy resources. Implementation of this call will make it possible to increase the volume of manufactured product by 34.4 percent by the end of the five-year plan through introduction of progressive production processes based on unification and standardization of design solutions and also creative cooperation with scientific research organizations without essentially increasing the consumption of metal and of fuel and energy resources.

Introduction of the new range of our machine tools into production will now release more than 300 machine tool workers (calculated for annual output), approximately 2,000 square meters of production areas and will conserve approximately 100 tons of metal. And the total saving is more than 33.5 million rubles.

As is known, conservation begins with the design. So that more than 100 kilograms of metal calculated for each machine tool will be conserved in designs of the new range of broaching machines. The weight of each machine tool for machining bushings has been reduced considerably. The factor of reducing the specific metal consumption comprised 0.84 to 0.55 and the reduction factor of specific energy consumption is 0.4 to 0.29 in some special automatic vertical broaching machines, which provide a 1.3-2.6-fold increase of performance. Here is another example. A design of a special high-speed automatic vertical broaching machine for machining the locks of blades of model MP5-1020 has been developed. A broaching machine has been equipped for the first time with an industrial robot of centralized manufacture. Providing performance of up to 100 parts per hour, the machine tool has a mass 28 percent less than that of its predecessor. A total of 37 percent smaller area is required for installation of it. We are attempting to utilize more widely progressive nonmetal materials. Jointly with the Belorussian Republic NPO [Scientific Production Association] of Powder Metallurgy, our designers have recently been conducting an active search for efficient use and conservation of tool steel. For example, models of a bimetal broaching tool produced by explosive welding have already been developed. Work in this direction is continuing.

A significant contribution to conservation of rolled metal and of fuel and energy resources is being made by improving the technology and organization of

labor in billet and machining shops. A good example may be extensive introduction of welded base structures instead of cast structures at the plant. The plant, together with the SKB [Special Design Office] of Broaching Machines and the All-Union Institute of Welding Production, has accumulated extensive experience in design and manufacture of basic welded parts of broaching and special cutting-cutoff machines (an average of 350-400 tons of metal per year will be conserved). Work conducted jointly with BPI [Belorussian Polytechnical Institute] on introduction of ceramic filter screens makes it possible to decrease rejects three-fourths as much and to conserve approximately 30 tons of castings in such parts as slide valves. Scientists of the Physicotechnical Institute, BSSR Academy of Sciences, and the Belorussian Polytechnical Institute are assisting us to introduce chill-centrifugal casting. Expanded use of economical rolled metal sections and also of blanks produced by the continuous and chill-centrifugal casting method has been expanded. The latter will provide conservation of not less than 3,000 tons of metal.

The pre-Party competition is gaining strength. The heat of the labor competition permits one to state confidently: the collective will emerge to the new positions during the final year of the five-year plan in development of production, an increase of production efficiency and intensification of conservation.

6521
CSO: 1823/144

METAL-CUTTING AND METAL-FORMING MACHINE TOOLS

CENTRALIZED AUTOMATION ASSISTANCE URGED BY CHIMKENT PLANT ENGINEER

Alma-Ata NARODNOYE KHOZYAYSTVO KAZAKHSTANA in Russian No 12, Dec 85 pp 10-11

[Article by F. Vetrov, design bureau chief at the Chimkent Cardan Shaft Plant: "Machine Tool Automation Centralized"]

[Text] In studying the country's economic and social development program for the new five-year period, one is persuaded again and again how important it is for us, the machine builders, to reorganize as quickly as possible, to change over without delay to the production of new generations of machinery and equipment, to introducing improved technologies which will permit a many-fold increase in labor productivity, reduction in materials-intensiveness and increased return on capital.

In order to resolve these tasks, the Chimkent Cardan Shafts Plant has outlined a five-year production retooling plan. We are striving to renovate and improve production through our own efforts to the extent possible. In cooperation with the "UNIPTIMASh" collective in Ulyanovsk, we have mechanized the collection of shavings from under the machine tools and have installed 700 meters of worm conveyors; we have also set up inter-operation and intrashop parts and subassembly transport using overhead chain conveyors and have introduced uniform shipping containers for materials.

In close cooperation with Minsk designers and technologists, we have set up Cardan shaft painting in a high-voltage electrostatic field. A manipulator was installed to do this. This measure enabled us to increase labor productivity, eliminate monotonous manual labor, improve painting quality and save paints and varnishes.

Gorkiy workers have designed and helped us manufacture test stands for checking Cardan shaft quality.

Standardizing Cardan shaft parts for GAZ-UAZ vehicles with Cardan shaft parts for MTZ tractors and many other vehicles required great effort. We established cooperative ties on their production with many other enterprises, including the Minsk Tractor Plant, Drogobychskiy Truck Crane Plant, Lutskiy Automotive Plant and dozens of others. This standardization has helped concentration production in a small products list and, in so doing, create conditions for production automation.

However, by no means is everything within our power. At our plant today, three-fourths of the machine tools are semiautomatic. Only 14 percent of our machine tools are automatic, that is, our level of automation is very low. At the same time, replacing just the lathe used for cutting internal threads with a special automatic machine tool has enabled us to raise the level of automation from 0.3 to 0.7-fold and labor productivity 1.5-fold. Moreover, workers are now rid of difficult, monotonous work. Another example: robotized VSh-670 double automatic machine tools made by the Vitebsk Plant imeni Kirov were introduced to replace semiautomatic centerless grinders, and labor productivity immediately increased five-fold (!).

Such changes make people happy and incline them to work creatively. Unfortunately, we have not always received the equipment needed from the machine tool manufacturers. And, when it has been impossible to replace our semiautomatic machine tools, we have tried to find other ways. Thus, our semiautomatic drill unit orders specify a larger number of parts to be machined simultaneously, and our broaching machine orders are for double, rather than single, machines, which has increased labor productivity 1.8-fold.

Recently, there have been positive shifts in the level of automation of machine tools using robots. But it is important in this regard that robotized machine tools (a semiautomatic machine tool plus a robot) be manufactured and supplied to customers in complete sets. By no means every consumer plant is able to update a machine tool, to manufacture or adapt a robot to it.

Thus far, there are few enterprises producing machine tools with a high level of automation. Naturally, not every machinebuilding plant will get their products, ourselves included. The low level of automation of the general- (multi-) purpose machine tools being currently produced testifies to the lag in machine tool manufacturing. Thus, the lathe group consists of 212 type-sizes and is the largest group of metal-cutting general-purpose machine tools (29.2 percent). Half of them are mechanized machine tools (IK62 or 16K20) and the like. They are designed for single-item and small-series production. But multiple-cutter semiautomatic lathes for large-series and mass production comprise only 3.3 percent of the lathe group and 0.1 percent of all metal-cutting machine tools.

It is precisely this lack of needed machine tools that has forced us to use the model SA-308 semiautomatic multiple-cutter machine tools to manufacture spiders, although they were designed for use in series production. Under the conditions here, where we have to make frequent switch-overs, their cumbersome kinematic circuitry is unreliable: the electromagnetic clutches malfunction regularly, the internal switching drive burns up and the oil overheats.

Our attempts to get ahold of special automatic machines for turning spiders have come to naught. This, in spite of the fact that we know the Gorkiy Automotive plant manufactures an automatic machine it designed itself (the AS-5219) which is the equal of foreign models in terms of productivity. One can but envy the Gorkiy workers and wonder why these automatic machines have not been put into series production.

In view of all this, we have been forced to deal for the time being with the semiautomatic SA-308, as we have no other choice. But there is one large

obstacle to our bringing it up to automatic machine-tool status by using robots: it necessitates a substantial increase in production area, which is doubtless inefficient. And just six of the Gorkiy-type machine tools would replace 18 of our semiautomatic machines with robots!

Now, about the drill group. Of the 26 type-sizes, only four are semiautomatic, and none at all are automatic. Drills have the very lowest level of automation, 0.2. This means the drill operator must perform eight of every nine operation elements manually. It hardly needs to be proven that, in this situation, a technologist cannot count on multiple-machine tool servicing or on increasing the level of automation.

It is hard to understand why general- (multi-)purpose drills in production have heretofore been only mechanized, while it is time they were at least semiautomatic. In the meantime, we have to rack our brains trying to improve them. It is also surprising that five type-sizes of drills are being produced by 16 enterprises nationwide.

One might ask why an engineer concerned with mass production would pay attention to multipurpose machine tools, which are used in series production. The fact is, he is forced to take any machine tools he can get, no matter how imperfect.

And things are even worse with regard to raising the level of automation of assembly equipment, little of which is even produced. The large machinebuilding plants design and produce them themselves. We know of an automatic machine for assembling a spring-loaded stuffing box and bearing. One of the bearing plants has mastered its production. Here, it would free 10 people for other work. There are good automatic machines at a number of other enterprises. But it is useless to order such equipment and practically impossible to obtain it.

It is time, it seems to us, to abandon the principle of "make everything yourself." The process of retooling small enterprises is inordinately drawn out following it.

The question automatically arises from this of whether it is necessary to consolidate, specialize and concentrate the forces of all branch ministries, and foremost of machinebuilding, in the area of automating the machine-tool fleet. No matter how much we may be in favor of scientific-technical progress, our efforts alone are inadequate to improve the machine-tool fleet. Things need to be set up so that successful units and automatic machines manufactured and proven in operation at individual plants will be put into series production. It would then no longer be necessary to "re-invent the wheel" independently, and needed equipment could be ordered. This would save materials, funds and labor resources.

One other suggestion: it is time to eliminate the noncentralized manufacture of general-purpose machinebuilding parts. Enterprises must be freed of this concern. It is more appropriate to set up the special production of needed parts in individual regions.

11052
CSO: 1823/134

OTHER METALWORKING EQUIPMENT

UDC: 006.354.033:006.354.05:621.9

LARGE-SCALE STANDARDIZATION IN THE MACHINE INDUSTRY

Moscow STANDARTY I KACHESTVO in Russian No 10, Oct 85 pp 7-9

[Article by A.N. Baykov, B.S. Boskoboynikov (ENIMS), and A. K. Pentelin (VNIIS): "Programs for Large-Scale Standardization and International Standards in Machine Building"]

[Text] The high rate of growth of the Soviet machine-building industry has now made it necessary to create and more quickly master new types of mechanized and automated machine tools.

At the present time, NC lathes, automated computer-controlled lathe lines and systems as well as flexible production systems that can reduce the time spent on resetting equipment and machining parts are receiving ever-increasing use. Therefore, it has been estimated that by 1990, more than 50 percent of the produced NC machine tools will be used in automated systems with central computer control and that the number of flexible production systems will rise substantially.

Standardization has a very important role in the reliability and efficient operation of automated production systems.

In recent years, the Soviet Union has developed programs for large-scale standardization of automated equipment, industrial robots, manipulators, etc., the introduction of which has produced great savings for the Soviet economy. Thus, the realization of the "NC Metal-Cutting Equipment" program has produced a savings of about 10 million rubles. The "Aggregate Machine Tools" program resulted in the unification of machine tool parameters and dimensions and this reduced the number of standardized units from 221 to 174.

In accordance with the "Automated Lines, Automation, Semiautomation and Advanced Metal-Cutting Machines For Machine Building and Metal Working" program, work is being completed on an NTD [not further identified] complex including over 160 state and industrial standards as well as the technical conditions regulating the specifications on the materials, elements, equipment, components and parts used to build machine tools, the test methods, storage procedures and their operation. Thus, in the revision of GOST 18100-80 "Automated single-spindle turret bar lathes. Precision and strength standards", 25 percent of the precision norms according to basic testing were made stricter. There will be introduced a series of new tests that are

supposed to raise by 60 percent the machining precision and to fully eliminate coarser precision grades from the standards.

Realization of the large-scale programs will produce a significant amount of savings and this will be reflected in a 150-160 percent increase in the output of metal-cutting lathes, a 120-130 percent increase in product precision and a a 140-160 percent increase in the reliability and service life of automated lines and automated and semiautomated equipment. This in turn will make it possible to reduce the quantity of manufactured machine tools and a corresponding amount of production facilities, the amount of manual labor in many sections, the number of production and auxiliary personnel and the amount of transport work, etc.

If these measures are implemented throughout the national economy, we will see an estimated savings of no less than 4 million rubles.

The enhanced specifications are applied to the ergonomics (arrangement of the control organs, the direction of their motion and the optimal forces on them) of newly-designed machine tools and the design features of the tools. This also makes it possible to install active-control devices, digital indicators, automatic part and metal cutter changers and other automated devices.

New requirements are being established for electrical equipment both for individual machine tools as well as for automated systems. The technical specifications for metal-cutting lathes now for the first time include indicators on the consumption of material and electrical energy.

The developed standards for new equipment provide increased output. Thus, the output of the model 65A60 MF4 drilling, cutting and boring NC machine is 1.6 times greater than that of the 6560 MF3 and it is also of higher precision.

Along with the large-scale programs for standardizing metal-cutting machinery, the industry has prepared and successfully realized a standardization program aimed at increasing the technological quality and quality of wood-working equipment, pressing and forging equipment and solid-welding and diamond instruments. A considerable amount of work is being done to standardize casting and welding equipment, measurement and abrasive equipment as well as hydraulic and pneumatic equipment and its attachments.

A great role in the development of the modern standards used in the machine-building industry's large-scale standardization program is being played by the use of progressive indicators of the ISO [International Organization for Standardization] international standards on which the "Machine Tools" technical committee 39 is working.

At the present time, 48 nations are participating in the work of this committee. The 69 international standards that they have developed are being used in the design and operating specifications for machine tools (International Standard 31), the methods used to test them (28), terms and definitions (7) and others.

In accordance with the technological program of the ISO's Technical Committee 39 for 1985-1987, 47 new international standards will be developed, 16 of which require the addition of improved indicators into developed international standards, 8 of which establish rules for the precision testing of various machine tools and 14 of which regulate specifications for consignment testing of wood-working machines, etc.

To create unified components and assemblies for machine tools, presses and forging equipment, it is very important to coordinate the work of the ISO Technical Committee 39 with that of other technical committees of the ISO, International Electronics Commission and other organizations working in standards within adjacent branches of industry.

For example, the ISO Technical Committee 39 has devoted special attention to joint work with Technical Committee 184, "Data-Processing Systems For Industrial Automation". The technical organs within the latter committee consider the problems connected with the development of international standards for numerical control devices, industrial robots, data-programming languages, communications systems between automated objects, etc.

ISO Technical Committee 39 maintains active communications with the International Electronics Commission and that organization's Technical Committee 44, "Electrical Equipment for Industrial Machinery". The international standards regulating specifications for the electrical equipment of machine tools on the world market are widely used by the leading producers of metal-cutting equipment.

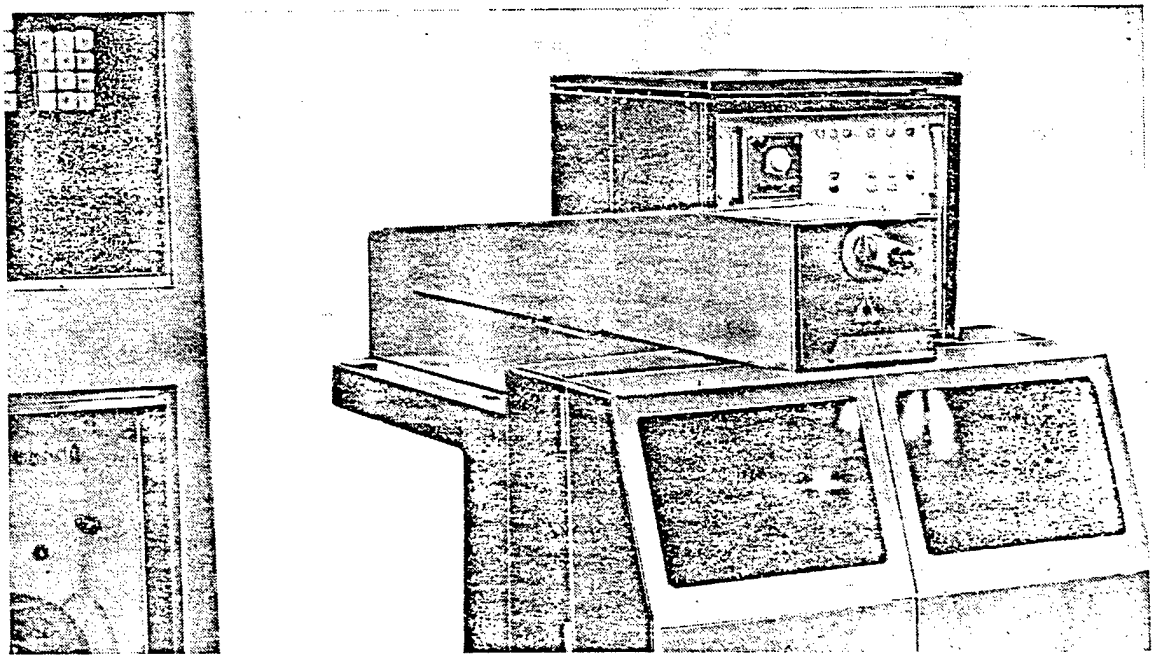
A considerable amount of work on cooperation in the area of international standardization is being conducted within CEMA. Among the CEMA nations, mutual trade in metal-cutting machinery and their trade with other countries has made it necessary to harmonize CEMA standards and use a unified approach to precision testing of equipment, make machines in automated lines and complexes and the components and parts in the machines interchangeable and unify the attachment dimensions of revolving heads, cutting instruments and other components. Thus, in 1982-83, CEMA used ISO international standards to develop 15 of their own standards on testing, schemes and methods for measurement of geometrical parameters, etc. and 11 of these standards were introduced to the national economy (ST SEV 3719-82, 3721-82, 4141-83, 4143-83, 4145-83 and others).

Work is being continued to develop CEMA standards on the precision norms of individual types of machine tools for all basic groups of metal-cutting equipment.

We must also point out that the ISO international standards are finding increasingly wider application in Soviet industry. This has allowed us to considerably reduce the costs of developing new standard specifications or revising the old ones. For example, only through eliminating the research and development work usually conducted to establish necessary parameters, the use of ISO international standard 2423-74, 3655/0-76 and 6480-80 made it possible

to reduce by about 30 percent the time and cost to develop GOST 98-83E "Radial drilling machines. Precision and strength norms".

The data shows that the wide use of international standards is an important and necessary condition for enhancing the quality of technical standards in machine building and the quality of this production.



4R222F2 numerical-control laser for dimensional working of various materials including diamonds, ceramics and corundum. The radiation energy is 2 J, frequency is 20 Hz and the hole depth is as much as 10 mm.

12261
CSO: 1823/115

OTHER METALWORKING EQUIPMENT

KIEV CONFERENCE ON LASERS IN MACHINE TOOL, INSTRUMENT MANUFACTURING

Kiev TEKHNOLOGIYA I ORGANIZATSIYA PROIZVODSTVA in Russian No 1, Jan 86 p 57

[Article by N. I. Zakharova under the rubric "Seminars, Conferences, Meetings, Exhibits": "Development and Use of Laser Equipment and Technology in Machine and Instrument Manufacturing"]

[Text] A republic scientific-technical conference on "Developing and Using Laser Equipment and Technology in Machine and Instrument Manufacturing" organized by the UkSSR Ministry of Higher and Secondary Special Education, together with Kiev Polytechnical Institute and the Ukrainian Republic Board of the NTOmashprom [Machinebuilding Industry Scientific-Technical Society], was held in Kiev.

Participating in the work of the conference were academic and practical scientists from UkSSR VUZ's and scientific research institutions and organizations, representatives of republic industrial enterprises, and also representatives of a number of cities -- Moscow, Leningrad, Tula, Kuybyshev, Ryazan, Vilnius, Minsk, Tbilisi, and others.

The conference was opened by Docent and Candidate of Technical Sciences V. V. Dzhemelinskiy, pro-vice-chancellor at KPI [Kiev Polytechnical Institute] and deputy chairman of the conference organizing committee.

UkSSR State Prize winner, Professor and Doctor of Technical Sciences V. S. Kovalenko spoke to the plenary meeting. His report analyzed the development of laser equipment and technology in the Ukraine.

The speaker noted the great contributions of a number of the main scientific research institutes of the UkSSR Academy of Sciences engaged in researching the use of laser radiation and in developing new types of lasers to the resolution of theoretical and practical tasks -- Institute of Arc Welding imeni Ye. O. Paton, Institute of Electrodynamics of the UkSSR Academy of Sciences, UkSSR Academy of Sciences institutes in Lvov, Donetsk, Kharkov, and elsewhere.

A number of original studies have been made at republic VUZ's. Many of them were done within the framework of the republic's comprehensive inter-VUZ scientific-technical program. Under this program, the basic laser technology research is being done in the laser technology laboratory at KPI: development of

processes for broaching precision openings, cutting metal and nonmetallic materials, strengthening and laser-alloying the working surfaces of parts and tools. Studies of the basic laws of processes, the various physical phenomena in the zone of laser action on the material and the possibilities for controlling laser radiation are being done in cooperation with UkrSSR Academy of Sciences institutes and branch institutes. Laboratory developments have been introduced at a number of enterprises: the PO [production association] imeni S. P. Korolev, the "Bolshevik" and "Zavod Arsenal" production associations in Kiev, the "Zavod im. Malysheva" production association in Kharkov, and others, for a total economic impact of one million rubles.

The laser technology laboratory is a unique academic-scientific center offering enterprises active technical assistance in solving a number of scientific and technical problems involved in introducing laser technology and training personnel for those enterprises. Laboratory associates gave 18 reports at the conference.

Doctor of Technical Sciences and Professor at MVTU imeni Bauman A. G. Grigoryants spoke to those at the plenary meeting on "Laser Welding and Surfacing in Machinebuilding" and G. N. Tarkhov, a department head at Saratov Polytechnical Institute, gave a report on "The Technological Radiator As A Relaxation Oscillator."

The conference work was done in three sections, which examined the following questions:

innovations in the development and use of laser technological equipment; systems and devices for spatial control of laser radiation; measuring laser radiation parameters; developing and improving technological operations; laser welding; cutting and laying out materials using laser radiation (Section I);

strengthening machinery, instrument, cutting tool and die parts using laser radiation; modifying material surface layers by heating with laser radiation (Section II);

using laser radiation to amorphize materials; apparatus and methods for studying the structure and physicochemical properties of amorphized surfaces of materials; using laser radiation in FMS, and others (Section III).

There was much interest in the reports by Candidate of Technical Sciences V. P. Garashchuk, a laboratory head at the Arc Welding Institute imeni Ye. O Paton, on "Studying Polarization of Powerful Gas Laser Radiation" and Doctor of Technical Sciences Yu. M. Lakhtin, a professor at Moscow Highway Institute, on "Laser Surface Alloying of Corrosion-Resistant Chrome Steels."

In their speeches, the representatives of industrial enterprises familiarized conference participants with operating laser sectors -- a tool strengthening sector at "Bolshevik" PO (Kiev), a sheet metal layout sector (in Nikolayev) -- and with an automatic line for laser-strengthening aluminum-alloy cylinder head blocks at the Moscow Automotive Plant imeni I. A. Likhachev.

The conference materials were reflected in a collection of summaries of the reports.

Practical recommendations were made on introducing progressive technological processes for working materials using lasers into production on a broader basis, on training, improving the skills of and retraining specialists in this field, and on improving the coordination and effectiveness of research and development in the field of laser engineering and technology.

11052
CSO: 1823/121

OTHER METALWORKING EQUIPMENT

UDC 621.9.048.7

LASER TECHNOLOGY FOR MACHINING CENTER HOLES IN METAL

Kiev TEKHNOLOGIYA I ORGANIZATSIYA PROIZVODSTVA in Russian No 1, Jan 86 pp 41-42

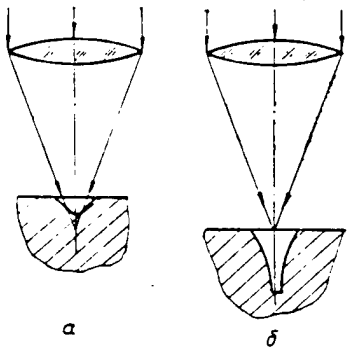
[Article by Doctor of Technical Sciences V. S. Kovalenko and Candidate of Technical Sciences V. P. Dyatel under the heading "Electrophysical and Electrochemical Methods of Working Metal": "Laser Treatment of Center Holes"]

[Text] Working openings in hard-to-work materials (hard and magnetic alloys, stainless and heat-treated steels, ceramics, and so on) by cutting is very labor intensive and is characterized by the expenditure of considerable expensive tool material. The productivity of working center holes is especially low; in hard-alloy parts, such holes are made by electroerosion [electrical-discharge] broaching; diamond tools are mainly used to make center holes in parts made of other hard-to-work materials.

The laser technology laboratory at Kiev Polytechnical Institute has proposed using laser radiation to work small-diameter center holes in parts made of hard-to-work materials. They suggest using a modernized Kvant-16 laser, the modernization consisting of reducing the divergence and duration of the light pulse. Since the radiation of the laser generator in this unit is invisible, a type LG-78 or LGN-103 gas laser is placed coaxially to the optical axis of the generator in the rear portion of the unit to permit visualization of the focusing zone and to make it easier to align the optical elements. Its radiation is focused at a visible point of red light, which is the lens focus.

In view of the fact that center openings are complex in shape, they are worked in two passes, the first pass forming the entry cone of the opening and the second pass forming its contour.

The method of working a center hole is as follows. The operator secures in a jig a blank whose surface has been marked with the center of the hole to be worked. The laser unit is switched on and the gas-laser radiation passes through a lens and is focused on the surface of the part at a visible point of red light. The jig and part are positioned so that the center of the opening being worked coincides with the visible red dot. Using a visual optical system, the surface of the part being worked is moved to the focal plane of the focusing lens and is moved towards the lens so that its focus is 3-4 mm into the part (see drawing a , following page).



How a center hole is worked.

The laser generator is switched on. After 3-5 pulses of radiation are fed to the zone being worked, a recess is formed -- the initial cone of the center hole -- with an opening of 80-100° and up to 2 mm deep. The part is turned to the initial position (lens focus on the surface of the part), the laser generator is switched on again, and after 5-8 pulses the shape of the hole is complete and the depth has been increased to 4-6 mm (see drawing b).

Center holes are worked at the following conditions: light pulse energy -- 20-25 J; lens focal length -- 70-80 mm; pulse tracking frequency -- 0.5 - 1 Hz; number of pulses directed at the zone being worked -- 8-13. Hole diameter can be from 0.6 to 1 mm, to a depth of 6 mm; process takes 5-20 sec. The size of the hole being worked can be changed by varying the radiation energy, lens focal length, and position of the part surface relative to the focus.

The use of laser radiation to make center holes in parts made of hard-to-work materials permits a 10- to 20-fold increase in productivity of the process as compared with electroerosion broaching or using diamond tools.

11052
CSO: 1823/121

OTHER METALWORKING EQUIPMENT

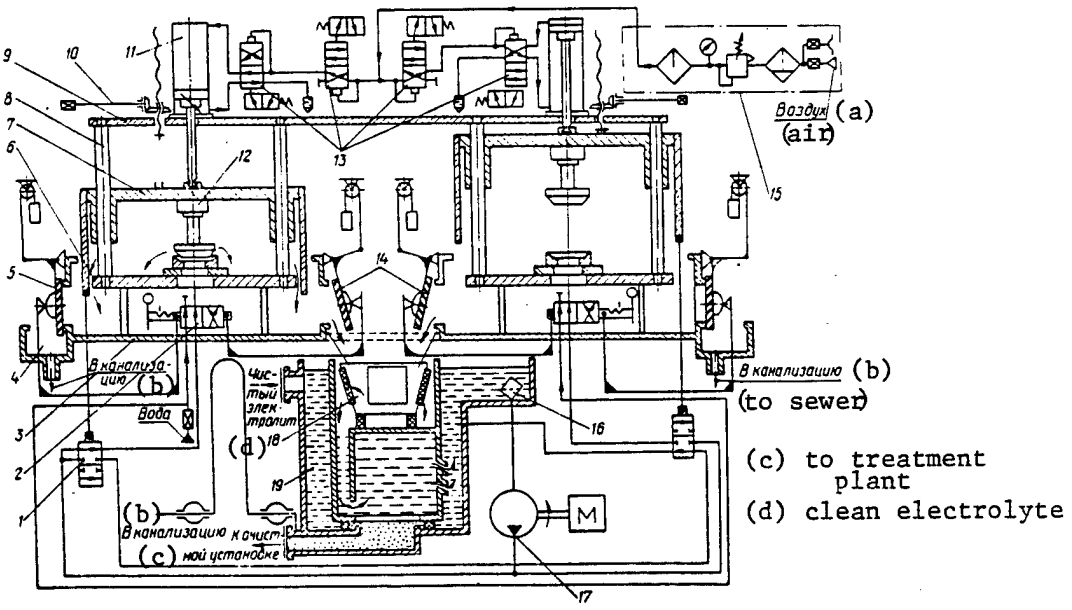
UDC 621.9.030.5

SDL-3 ELECTROCHEMICAL MACHINE TOOL

Kiev TEKHNOLOGIYA I ORGANIZATSIYA PROIZVODSTVA in Russian No 1, Jan 86 pp 43-44

[Article by engineers A. I. Dubovik, V. I. Suslin and L. Ye. Blokh: "Model SDL-3 Machine Tool for Electrochemical Machining of Parts"]

[Text] The Model SDL-3 machine tool (See drawing) is designed for deburring, dulling sharp edges and perforating thin-walled parts, as well as for finishing-calibration work. It can machine complexly-shaped surfaces and spaces, including ones in parts made of hard-to-work materials, when the use of traditional methods is impossible due to difficult access to areas to be machined, poor rigidity of the part, or for other reasons.



The machine tool is two-position, semiautomatic, with its own process-current source. It is constructed using basic subassemblies (modules and tanks) and equipment comprising systems for supplying electrolyte and flushing fluid,

process current supply, compressed air supply and ventilation; these are assembled separately and mounted on the frame.

The machine-tool module is a unit consisting of two working chambers and one collector. This main subassembly design permits arranging the necessary number of working positions on a single frame and building the electrochemical machining unit into automatic lines.

The working chamber is comprised of a table (6), upper plate (9) and connecting columns (8) along which carriage (7) travels. The chamber is a rigid, enclosed component which can handle all the power loads. Carriage (7) is moved by a pneumatic cylinder (11) installed on upper plate (9) which also has mounted on it the manual (set-up) carriage travel drive (10).

The fixed portion of the cathode unit (KU), on which the part being worked is set, is secured to working table (6) using L-shaped clamps. The shank of the fixed portion of the KU is secured in a tail-spindle clamp (12) on the crosspiece of carriage (7).

The two identical working chambers are situated in a common collector which consists of a pan (3), two valve units (1), one in each working chamber, and two petcocks (2) through which the electrolyte or flushing fluid is fed to the work position and then flows out through slide valves (5) and (14). The latter are interlocked with the drive for petcock (2), ensuring that the electrolyte or flushing fluid will go to the appropriate compartment of the tank.

The machine tool tank is for storing and cleaning the electrolyte. It is installed on the lower portion of the frame, under the module, and consists of two compartments: (4), for draining the flushing fluid, and a common compartment for the electrolyte. The main compartment has a receiving tank (18) into which the used electrolyte is drained and a suction filter (16). The electrolyte in the receiving tank is filtered through screen filters, then flows through slits positioned in a particular manner to an outside tank (19), where the electrolyte is treated by settling. The cleaned electrolyte is pumped back to the work position through filter (16).

The machine tool frame consists of two parts, an upper and a lower, which are assembled into a single component. The panels, boards and doors of the outside casing of the machine tool are also installed on the frame.

The electrolyte and flushing fluid feed system ensures that the electrolyte is pumped through the space between the electrodes (MEP) at a certain speed and pressure. It consists of a pump (17) and pipes. The pump supplies electrolyte under pressure to the valve unit (1) of the working chamber operating at that moment; the electrolyte then moves through petcock (2) through channels in the lower portion if the KU to the MEP and drains into the collector, and thence through the open slide valves (14) to receiving tank (18). To flush parts and the KU, with pump (17) switched off, the handle of the slide valve and petcock (2) is moved to the "flush" position, closing the electrolyte drain slide valve and opening slide valve (5) to let the flushing fluid into compartment (4).

The process current supply system provides a voltage-stabilized direct current to the part being worked (the anode) and to the working electrodes (cathodes). It is comprised of a type-VAKG [not further identified] power supply, buses connecting it to the machine tool, leads which are a subassembly of the working chamber, a machine-tool control panel and electrical equipment cabinet which houses the machine-tool automatic electrical equipment. Both working chambers receive process current from one source, so individual leads have been installed in them.

The machine tool working chamber carriage (7) is driven by pneumatic cylinders (11) operating off compressed air from the shop main. It includes an air preparation unit (15) consisting of a moisture trap, filtered oil splasher, pressure regulator and monitor. Operation of the pneumatic cylinders (11) is regulated by the position of pneumatic distributor (13), which is controlled electrically.

Gases are pumped from the working chamber while the machine tool is operating by gravity or by forced ventilation.

The machine tool has three operating modes: set-up and adjust, manual and semiautomatic. In the set-up and adjust mode, the KU is set up and its alignment with the lower and upper portions is checked without electrolyte or process current. In the manual mode, the carriage can be lowered manually and the KU tested with electrolyte and process current. In the semiautomatic mode, the working chambers can be operated simultaneously or alternating (with one operating and the other replacing the finished part with a blank).

The sequence of the technological process is as follows. A blank is placed in the work position. The operator pushes the "start" button of the appropriate working chamber, and the carriage drops down. Electrolyte moves through the MEP and process current is supplied. The part is worked. The carriage is then raised and the electrolyte and process current are switched off. The finished part is removed and a new blank is set in place. The finished part is flushed with electrolyte. Parts flushing before and after processing is included in technological cycle time.

The design of the machine tool working chambers permits rapid readjustment for working a variety of parts.

Specifications

maximum overall length of edge being worked, mm....	up to 5,000
capacity of electrolyte tank, m^3.....	0.65
chamber dimensions, mm.....	400 x 350 x 250
process current source:	
current, A.....	up to 1,600
voltage, V.....	12 - 24
pressure in electrolyte feed system, kgs/cm^2.....	2
pump output, electrolyte feed, liters/minute.....	60
dimensions of machine tool without process current source, mm.....	1,200 x 1,200 x 2,300
weight, kg.....	1,000

The annual economic impact of introducing the machine tool, which is obtained as a result of the reduced labor-intensiveness of manufacturing the parts and the improved durability of the hydraulic unit, is up to 100,000 rubles.

The machine tool is protected by prototype [industrial model] certificate, by nine author's certificates in the USSR, and by patents in the USA, Britain, France, the FRG, Japan and Switzerland.

11052
CSO: 1823/121

AUTOMATED LINES AND AGGREGATED MACHINING SYSTEMS

PROBLEMS IN DEVELOPING FLEXIBLE AUTOMATION CITED

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 12, Dec 85 pp 43-53

[Article by D. Palterovich, doctor of economic sciences and professor: "Organizational and Economic Problems in the Development of Flexible Automation"]

[Excerpts] The draft of the CPSU Program notes that the fundamental question in the party's economic strategy is that of the basic acceleration of scientific-technical progress. We face the prospect of carrying out a new technical reconstruction of the national economy and, on this basis, of transforming the material-technical base of the society.

This document stresses the paramount importance of a rapid renovation of the production system on the basis of advanced technology and of the broad assimilation of the most progressive technological processes and flexible procedures permitting operational reorganization for the output of new products and yielding the greatest economic and social effect.

In the 11th Five-Year Plan, about 60,000 machine tools with ChPU [numerical program control (NC)] and 47,000 industrial robots were manufactured and more than 2,300 ASUTP's [plant technical management automation systems] and hundreds of ASPR's [automated systems for planning estimates], flexible modules and systems were created. Taking into account expenditures for research and development and the organization of introduction, programming and servicing, expenditures for flexible automation will reach several billion rubles. By way of comparison, let us recall that in the current five-year plan all capital investments in machine building and metalworking amounted to an average of 13 billion rubles a year.

These expenditures are still insufficiently effective. A significant disparity developed between the number of industrial robots produced and the number introduced. Thus, in the first half of 1984, according to the data of the USSR Central Statistical Administration, 6,800 industrial robots were manufactured and only 2,500 were introduced. In 1985, it was planned to install about 4,000 machine tools and forging and pressing machines with NC and more than 5,000 robots. Inasmuch as 13,200 machine tools with NC and 13,700 robots were manufactured in 1984, the result is that even taking into

account the annual lag between production and installation, the plan for production is triple the plan for introduction.

Besides the examples of the successful application of the means of flexible automation, according to the data of a number of investigations and individual publications, a significant number of robots and machining centers are not utilized for a long time or have no real effect because of the high cost, low shift index, frequent downtime, and inadequate liberation of workers. Many ASUPT's are used to resolve too few tasks and are not, in essence, control but information systems.

The incomplete introduction of flexible automation is to the detriment of its development. The tremendous technical possibilities that automation opens up are in conflict with the methods for the planning of the creation and introduction of GPS's [Flexible Production Systems] and with the organizational and economic mechanism for putting into effect the latest technical achievements. Let us look at this contradiciton in greater detail.

In regard to planning, serious conflicts arise here in determining the scale of the introduction of GSP's, their structure, specific areas for rational application, and the objects of automation. The requirements of the acceleraton of the increase in labor productivity and the resolution of other social and technical tasks dictate the necessity of the rapid expansion of the scale of automation. The realization of this goal, however, encounters technical and production limitations, including the insufficient reliability of complex automated equipment, difficulties in organizing its production, and the unpreparedness of consumers for its assimilation and effective utilization. In this connection, skepticism is frequently seen in relation to the advisability of the forced introduction of robots and flexible production systems and there are proposals to concentrate attention on improving reliability and on developing the conditions for the utilization of small flexible production modules. (Footnote 3) (Quite convincing in this connection is the article by G. Kulagin, "On Some Conditions for the Intensification of Machine Building Producton," PLANOVOYE KHOZYAYSTVO, No 7, 1985)

At the same time, however, the proposal--persuasive at first glance--to concentrate efforts on the introduction of small and relatively simple means and systems of flexible automation is in conflict with the basic objective of creating flexible production systems. The fact is that the capability of an enterprise to reorganize itself quickly for the output of new products and to shorten drastically the cycle for the assimilation of new technology can hardly increase sustantially as the result of the establishment of one or two GPS's--as for the mechanical machining of individual groups of components, for example. Such a capability appears only when with the help of a number of GPS's with a high degree of integration (including automated systems for planning and the technological preparation of production, transport and storage sytems, etc.) basic components of finished output will be produced. This conclusion became especially obvious against the background of the low efficiency of the assimilation of individual industrial manipulators into nonautomated production processes.

Consequently, the task of the accelerated overcoming of the difficulties of the first stage in the development of flexible automation and the transition form isolated elements of it to complex systems is attaining particular importance.

Need and Structure

The generally accepted methods for planning the need for equipment, being based upon specific standards per unit of output and upon substitution standards, turn out to be unsuitable for the determination of the need for means and systems of flexible automation. In addition, the uncritical application of these methods leads to such negative phenomena as the already-mentioned disparity between the number of robots produced and the number introduced or their installation for reasons of prestige.

In the example of NC equipment and industrial robots, one can see how important for the planning of need it is to work out a progressive technical and structural policy for the development of each direction of flexible automation. The USSR occupies one of the top places in the world in the quantity of metal-cutting machine tools with NC. According to our estimates, their number will exceed 85,000 units by the end of 1985. Advanced domestic and foreign experience shows, however, that at the present time the role of program automation is determined not by the overall number of machine tools with NC but above all by the share of the most complex machine tools of the "machining center" type having extensive functional possibilities--multiple-operations machine tools with automatic substitution of tools and, in the most complete versions, with adaptive control systems providing for an increase in productivity by a factor of five to seven and a transition to a technology requiring few people.

Consequently, technical policy must be oriented toward qualitative rather than quantitative growth and toward the creation of equipment for technology with few people. Progressive machine tool building associations, above all the Ivanovo Association and the Leningrad Association imeni Ya. M. Sverdlov that have mastered the production of contemporary machining centers competitive in the world market, are already concentrating their efforts on the resolution of this task. At the same time, structural progress must be implemented more intensively, naturally under the condition of the appropriate organizational and technical preparation of the equipment users.

In regard to the large-series (measured in thousands of units) output of relatively simple NC machine tools and robotized complexes based upon them (as is foreseen, for example, at the Krasnyy Proletariy Production Association and several other machine tool building associations), it is our view that such a technical and structural policy requires additional economic justification. The following considerations, for example, give evidence of its necessity.

NC machine tools are more expensive than ordinary machine tools by a factor of five to seven. According to calculations presented in the price confirmation, their productivity is higher by a factor of two to two and a half and operators believe it to be no more than one and a half times as great. The additional advantages of NC machine tools are not always realized adequately.

For many years, their shift index in machine building was lower than for ordinary machine tools and the data of a statistical survey carried out 17 May 1984 showed it to be only 3.5 percent higher. This indicator is substantially lower for robotized equipment.

The high cost of the means of flexible automation puts particular demands on their load level. Thus, instead of the largest-scale lathe, Model 16K20P costing 5,800 rubles, the Moscow plant Krasnyy Proletariy produces the NC lathe based on it and costing 43,800 rubles (Footntoe 4) (see PLANOVOYE KHOZYAYSTVO, No 7, 1985, p 25) and, in combination with the robot, it will cost the user about 30,000 rubles more. The robot thereby performs only the operations of positioning and removing parts that are first placed on the accumulating table by hand. Moreover, a robot of this type requires substantial additional production space. When one person operates two robotized complexes, one worker is freed per shift, but taking into account the supplementary requirement for programmers, adjusters and electronics specialists, it turns out that considerably fewer employees are freed. Obviously, the necessity of a three-shift continuous loading of machining centers, convincingly demonstrated by G.A. Kulagin in the above-mentioned article, also fully applies to similar robotized machine tools. The economic expediency of their planned production, numbering several thousand per year, will be completely determined by how well the machine building enterprises are able to provide for such a work schedule.

In this connection, the opinion of Prof L.I. Volchkevich on the necessity of significantly changing the structure of industrial robots seems to be worthy of attention. He calls for a sharp reduction in the share of transport and loading manipulators (according to the data of one of the surveys, they account for 72 percent of all robots at 52 machine building enterprises) and a shift of the main emphasis to robots of the industrial type performing the operations of assembly, welding, cutting, painting, etc. (Footnote 5) (L. Volchkevich, "Robots Today and Tomorrow," IZBESTIYA, 2 July 1985). By the way, we observed that at the recent international robotics exhibition in Moscow almost all of the foreign firms showed not transporting but industrial and universal (multiple-function) robots.

In our view, the policy of rapidly increasing the production of simple manipulators operating under the principle "take and place" and also set up separately from the machine tool and therefore occupying significant additional space was not very effective and in some cases even discredited robotics in the eyes of enterprise managers. Obviously, sectorial and intersectorial entities for the centralized management of technical policy are called upon to be more careful in determining the basic proportions in the structure of new technology based upon the economic justification of the need and efficiency of each type and level of this technology. For this purpose, these entities must be freed from the necessity of resolving such day-to-day questions as the establishment of a specific products list and the distribution of each individual means of flexible automation.

A large role in the determination of the requirement of the technological and the type and size structure of the means of flexible automation must be played by their suppliers. Very instructive in this connection is the experience of

the Ivanovo Machine Tool Building Asseociation, actively participating in the determination of the specific requirements of customers for their output--machining centers and GPS's. Particularly important is the analysis of the conditions and needs of the customer carried out by the association, the issuing of recommendations to the customer on the designs and utilization of machining centers essential for the manufacture of specific items, and also the refusal to deliver complex machine tools to users unprepared to operate them.

In essence, here the supplier participates not only in the determination but also in the formation of the demand for his output. As a rule, the Ivanovo Association seeks to deliver its products to the customer acquiring not one machining center but several. In taking on the planning of complex machine tools and GPS's "to fit" a customer, it considers the nature and variability of his output, specific production conditions, and the preparedness to utilize equipment. It is obvious that the entire process of the establishment of GPS's must be organized only under such principles.

Spcialization, Unification and the Modular Principle

The most common reason for many of the difficulties in connection with the development of flexible automation--difficulties such as slow assimilation, a low level of utilization, and an inadequate correspondence between automatic equipment and the conditions of the area of application--lies in the lack of or the undeveloped state of sectorial and functional specialization in the process of the development and introduction of these types of new technology.

In the recent past, the negative consequences of despecialization were clearly manifested in the formation of automated control systems, when each branch created its own automated control systems. In duplicating developments and making poor use of effective standard plans and solutions, the enterprises spent billions of rubles. The absence of one single sector creating automated control systems and the lack of a unified technical policy in this area brought about the formation of an irrational structure of systems. Most of the means were directed to establishment of automated control systems that did not rely on the most efficient systems of managing industrial processes, were mainly used for accounting calculations, and were seldom very successful.

The low level of specialization was clearly manifested in the development of robotics. At the present time, all machine building and some nonmachine building ministries are developing and producing automatic manipulators and industrial robots.

Hundreds of research institutes, design bureaus, VUZ's, scientific production associations and enterprises were involved in the robotics program

The proposed dispersal of robot building in many sectors was based upon the modular principle of robot production. It was considered that the enterprises of the machine tool building, electrotechnical and electronics industries will produce the corresponding standardized mechanical, electrical and control modules, from which the consumers will collect the robots that they need as from a designer. In reality, the specialized production of modules has not

yet been organized on the necessary scale and the enterprises have to manufacture for their own needs not only robots but also completing products.

The creation of a very large number of models of manipulators is one of the most negative results of despecialization. By mid-1983 in many ministries, the forces of research institutes and PKTI's [planning and design and technological institutes] developed more than 200 models and modifications of robots, of which about 40 were issued in series production. Overlapping and duplication occurred not only in the area of development but also in that of production and application. Thus, in 1983, more than six models of manipulators were developed for cold sheet stamping, whereby all of them have the same configuration, similar characteristics, and analogous subassemblies and drives. But each sector uses its own completing products for building robots, which greatly complicates operations and repair and the training of personnel to operate them and consequently increases the cost of assimilation. (Footnote 6) (S.B. Abramov, "Mechanization of Manual Labor," ZNANIYE, Moscow, 1983, pp 15, 35)

It is expedient to perform special investigations to determine the number of models of manipulators that are needed for the national economy and its basic sectors. There is no doubt that under the conditions of the intensification and specialization of the production of robots one could get along with a considerably smaller number of models. According to the studies of the ENIMS [Experimental Research Institute for Metal-Cutting Machine Tools], the possible configurations of specialized aggregate automatic manipulators for operating metalworking and assembly equipment include only 5 base models and 16 modifications. In regard to the completing products, according to the data of Ye.I. Yurevich, one of the leading specialists in the area of robotics, to build industrial robots for all basic purposes it is sufficient to have 10 pneumatic, 20 hydraulic and 15 electromechanical modules. (Footntoe 7) (VESTNIK MASHINOSTROYENIYA, No 8, 1981, pp 3-4)

In the opinion of specialists, the series manufacture of manipulators in module form under the unit principle, including not only the mechanical part but also the control system, will make it possible to lower their generally very high price to one-fifth to one-fourth of the original level, providing for a corresponding reduction in the reimbursement period.

Under no circumstance, in our view, should one allow the development of trends toward "subsistence farming" in the area of the establishment of flexible production systems. For the expenditures, difficulties in introduction, and the number of independent components of each system are incomparably higher than for individual machine tools or presses equipped with manipulators.

Of crucial importance for determining the expediency, scale and methods in the establishment of GPS's is the fact that flexible manufacturing systems are not just complexes of automated equipment but necessarily are also a FUNDAMENTALLY NEW ORGANIZATION OF PRODUCTION--from planning to the warehousing and delivery of finished products. The establishment of this new organizaton presupposes the resolution of very complex tasks related to the specialization of production and to the change in technology and sometimes also the design of a product and materials, management methods, diagnostics and control, the

dimensions of production spaces, the arrangement of equipment, transport flows, the quality of intermediate products and tools, the conditions of supply and cooperation, the structure and skills of personnel, etc. Any disproportion--the compatibility, for example, of the system for controlling individual units of equipment and the control systems at a higher level--as well as inadequate reliability or extent of program and technological equipment can make an entire GPS established at the site of previously functioning capacities inoperative. Therefore, the establishment of a GPS requires a system approach and unified control.

The organization that is now in effect for the establishment of metalworking GPS's provides that the Ministry of the Machine Tool and Tool Building Industry supplies machine tool modules for them, primarily machining centers. Other ministries have been assigned the delivery of equipment for automated warehouses, transport systems, and also control systems. Basically, the users themselves must carry out the planning, batching, assembly, start-up work, and servicing of GPS's.

The first steps in the realization of what has been outlined indicate that by no means are we always successful in synchronizing the production and delivery of all GPS components and in providing for their compatibility and reliability under conditions of the departmental isolation of all participants and the absence of one single organization responsible for the planning, delivery and "turnkey" surrender of finished GPS's.

The complexity and diversity of the means and systems of flexible automation make standardization and the modular priniciple for their creation absolutely essential conditions for the efficient development of the examined direction of the NTP [not further identified]. Only the building of robotic complexes, GPS's and flexible manufacturing systems from standardized modules and the classification of NC systems and control programs by type can be the basis of the industrial organization of the manufacture and procurement of automated systems. Such an organization, implemented by specialized associations, will make it possible to reduce the number of modules and types of equipment and its subassemblies and outfitting, significantly lower expenditures for the development, assimilation and program equipping of flexible automated technology, prevent users from acquiring equipment with systems of different types, and preclude their incompatibility and other negative effects that sharply diminish the efficiency of flexible automation.

It is important to put into effect the modular principle in various stages of the creation of the means and systems of flexible automation. Thus, specialized enterprises producing industrial robots can manufacture mechanical modules and subassemblies or acquire them in cooperation. At the same time, other specialized enterprises must supply them modules of electrotechnical equipment and also NC systems (electric and electronic modules). Associations creating GPS's on the basis of NC equipment (machining centers, robotized machine tool modules, etc.) can produce this equipment independently or obtain it in cooperation. But control systems, SAPR's [computer-aided designs], and warehousing and transport systems compatible with basic industrial equipment must be supplied to them by enterprises specializing in the production of this equipment.

Obviously, the task of the authorities for centralized management must not be to establish in detail who is obliged to deliver what equipment to whom at what time but to determine a clear specialization of enterprises and a rational structure of demand for the means of flexible automation and to provide for their standardization and for the coordinated production, delivery and introduction of all elements of flexible systems. For the direct implementation of the enumerated functions, it is expedient to form intersectorial scientific production associations. A main designer with the necessary rights and resources must be designated for each direction of flexible automation or system type.

Distribution and Conditions of Utilization

The high cost and inadequate reliability of the means of automation and the difficulties in connection with their assimilation and utilization are holding up the influx of orders for some of their types. As shown by an analysis carried out by the State Commission of Experts on questions in the distribution and utilization of metalworking equipment in the national economy, progressive equipment (mainly automated) makes up an average of one-third of the total orders of 11 machine building ministries for metal-cutting machine tools and approximately one-sixth of total orders for forging and pressing equipment. (Footnote 8) (The data for each minisry are presented in the article of B.V, Balmont, minister of the machine tool and tool building industry (see: PLANOVOYE KHOZYAYSTVO, No 7, 1985, p 8)) This share is even lower for orders for metal-cutting equipment by ministries that do not build machines.

In this connection, it must be added that a significant portion of the means of flexible automation received by enterprises is not assimilated for a long time or is poorly utilized. During one of the checks at the Dinamo Electric Machine Building Plant in Moscow, for example, about 70 percent of the NC lathes were not working, three expensive machining centers were utilized for less than one shift, and more than half of the needed operators and adjusters of such equipment were lacking. There were similar occurrences at other enterprises as well and in individual cases NC lathes turned out to be unnecessary or were written off prior to the lapse of the amortization period. In this connection, the more than doubling of the output of NC lathes planned by the Ministry of the Machine Tool and Tool Building Industry for the 12th Five-Year Plan cannot be effective in the natinal economy unless serious measures are taken to improve their utilization.

Frequently the reaction of ministries to the lack of enterprise demand for progressive equipment is its forced distribution. Instead of painstaking work to prepare the enterprises for the utilization of the means and systems of flexible automation, the establishment of the corresponding projects for technical reequipping, and the giving of organizational help in introduction and the provision with personnel, etc., robotic complexes and even GPS's are simply distributed among user plants and the refusal to accept them is regarded as ignoring the tasks in the acceleraton of technical progress. In a number of cases, the substitution of organizational and economic methods of introducing the means of flexible automation through administrative methods of

their distribution means that for years they remain a dead weight in the warehouses of enterprises. Obviously, the inclusion of these resources in the distribution plans is inadmissible when there is no advance coordination with the enterprises.

NC lathes or robots should not be distributed under the principle "earrings for all sisters." Everyone knows that such equipment can be efficient only when it is concentrated in specialized shops or in sections in a quantity of not less than 20 to 25 units. According to a statistical survey carried out in May 1984, in those machine building enterprises where more than 20 NC lathes have been installed, the shift index of their work averaged 43 percent higher than at enterprises with up to 5 such machines and 20 percent higher than at enterprises where there were 6 of 10 of them. It is also important to consider that even to utilize two or three NC lathes or robotic complexes one needs a programmer, an adjuster, electronics specialists, repair workers with the appropriate skills, etc. This is all the more valid for GPS's.

At the present time, a large number of machine building sectors that do not yet have a single operating GPS and organizations capable of designing and producing them are planning to assimilate hundreds of flexible systems with their own forces. It seems, however, that it is essential to pay primary attention not to the quantity but to the technical level, fitness for work, and organization of the establishment of GPS's. We recall that there were only 150 flexible cells and 38 GPS's in the United States in 1984.

Of particular importance for the improved utilization of the means of flexible automation is the increase in their reliability. Thus, for some robot models the running time before failure under technical conditions is 100 to 130 hours and in reality is only a few hours in a number of cases, whereas advanced experience shows that the efficient load of robotics is achieved with a running time before breakdown of 2,000 hours or more. It is impossible to introduce technology for few people when the reliability of the means of flexible automation is inadequate. In regard to the achievement of the general goal of establishing highly integrated flexible manufacturing systems (including SAPR's, transport and warehousing, machining, and assembly systems combined into a single complex), it is realistic only after careful development and the ensuring of the reliability of each link.

A high level of equipment with tools and programs and technical servicing is an essential precondition for the efficient utilization of the means and systems of flexible automation. The scale of these tasks is indicated, for example, by the experience of the Ivanovo Machine Building Association, which requires many dozens of qualified mathematicians and programmers to program the equipment produced. Only a few enterprises using GPS's can independently provide them with control programs. In the initial stages at least, these functions must be performed by specialized organizations or subdivisions of machine tool building and other associations supplying equipment. It seems that such specialization of a functional type can be developed by way of the formation of enterprises staffed with qualified personnel or large specialized subdivisions carrying out the introduction, operation and repair of flexible systems.

Thus, the organizational and economic problems in the introduction of flexible automation must be resolved in a unified complex. Besides the questions reviewed, it includes the tasks in the preparation of specialists for the establishment, operation, and repair of GPS's and economic incentives, among other things, for evening and night work, etc.

9746
CSO: 1823/101

END